The Milbank Memorial Fund

QUARTERLY

CONTENTS

Vol. XXXIX OCTOBER 1961 No. 4

Edited by the Technical Staff

Published quarterly by the MILBANK MEMORIAL FUND, 40 Wall Street, New York 5, New York. Printed in the U. S. A. Subscription: $2.00 a year.

Entered as second-class matter at the Post Office at New York, N. Y., April 20, 1956, under the Act of March 8, 1879. Additional entry as second-class matter at the Post Office at Lancaster, Pa. Second class postage paid at New York, N. Y. and Lancaster, Pa.

IN THIS ISSUE

THE fresh viewpoints about mental hospitals and mental patient care which have been affecting American mental hospital systems during the last few years under the label of "open mental hospitals" have come to this country mainly from Britain. It is becoming clearer every day that the methods of the open mental hospital depend not only on the patients having physical freedom to move about much more than formerly, but also on the freedom of the community to come into the hospital as visitors, friends and, when indicated, as patients. Removing the barriers between the hospital and the community works both ways. While a start can be made in this direction within the framework of current legislation, in most jurisdictions it will be necessary to re-examine the legal and administrative machinery of the hospital systems, as Parliament recently did for the United Kingdom. It is therefore appropriate that New York State Senator George F. Metcalf, Chairman of the Senate Committee on Health has taken a look at some of the most advanced British programs and recorded his impressions of the lessons these programs hold for American state government.

• • •

New health problems emerge to challenge both preventive and medical practice as some diseases are controlled and other diseases and disabilities increase in a society which is experiencing great changes in its age structure as a result of increases in the aging population, high birth rates and changing patterns of urbanization and industrial methods. Present trends and predictions of future problems in public health are discussed by

Dr. Thomas McKeown in the article entitled "The Next Forty Years in Public Health." Dr. McKeown, professor of social medicine in the Medical School of Birmingham, England, reviews the current health problems in relation to mortality and morbidity trends in the British Isles, but the problems are similar in the United States and other Western countries. The general problems selected as having major significance in the future of public health are control of inheritance, control of both internal and external environmental factors and the organization of medical services.

• • •

Age at marriage affects the size of completed family and the age pattern of childbearing. Much of the speculation on the effect of postponement of marriage on population growth has been in terms of the probable magnitude of the first factor, and comparatively little attention has been directed to the second. In the paper "The Significance of Age-Patterns of Fertility in High Fertility Populations," by Ansley J. Coale and Cho-Yook Tye, birth and growth rates are compared in populations with different age patterns of childbearing. It is shown that in high fertility populations differences in average age of childbearing can account for differences in the stable rate of population growth to an extent equivalent to some twenty per cent difference in fertility, even if the completed family size is identical in each childbearing pattern. This suggests that postponement of marriage can be an important component of population control, even if it is not accompanied by a reduction in family size, and has significant implications in countries currently characterized by high fertility and early marriages.

THE ENGLISH OPEN MENTAL HOSPITAL: IMPLICATIONS FOR AMERICAN PSYCHIATRIC SERVICES

THE HON. GEORGE R. METCALF, CHAIRMAN
STATE OF NEW YORK, SENATE COMMITTEE ON PUBLIC HEALTH

DURING the past decade there has been increasing interest on this side of the Atlantic about the British experiment in the organization and administration of psychiatric services. For, while it remains true that present methods cannot cure persons suffering serious psychotic illnesses, the severity of the symptoms and the extent of personal and social disability which result can be reduced considerably by well-established techniques. These techniques include re-educational and psychotherapeutic measures, physical treatments (such as insulin coma and electroshock therapies and drug treatments of anxiety), and social manipulations of the patient's relationship to his environment. However, it has only recently been appreciated that a large proportion of the patient's more distressing and disabling symptoms can be prevented by appropriate conditions of living and treatment. It is this aspect which has been concentrated upon by the more advanced units of England's psychiatric services, and it is these open door mental hospitals and community psychiatric services which we can study with profit.

One of the earliest organizations to perceive this has been the Milbank Memorial Fund which has for the past five years been stimulating the American mental health movement by sponsoring study tours to England, by inviting the directors of England's open mental hospitals to visit their American colleagues, and by holding professional meetings at which the two groups could discuss theoretical considerations and practical applications of this approach to psychotic disability.

Last year I, too, journeyed to England to visit these pacesetting open door hospitals at the Fund's behest and have re-

turned convinced that we have much to learn from their experiences.

What distinguishes these "open door" hospitals?

One of the most striking features is immediately apparent as one enters them: by removing the prison atmosphere that has existed for almost a century, an image of fear was replaced by a feeling of warmth and understanding. This warmth and understanding of the patient and his problems seems to radiate wherever one goes. The bars and bolts and rings of keys, which for over 100 years signaled the asylum as a grim jail, a terminus at oblivion, are gone; they are as startling to the average American as today's general hospitals would have been to our great-grandfathers had they suddenly came across them. For the general hospital of a century ago was looked upon with fear and revulsion, a death house where "epidemic pestilences" made "patients, however extreme their need, dread the very name of hospital, and the most skillful surgeons distrust their own craft." * Thus one can say that public reaction to the general hospital before Lister's aseptic revolution, and popular reaction to today's locked mental hospitals, are analogous except in degree.

The second striking feature about these open hospitals is the acceptance and appreciation which they evoke in the communities they serve. They are seen as a place of hope, a place where the sick get treatment, a place which helps them recover from their illnesses and assists them to get re-established in the community. In the words of a supervising nurse at one of these trail-blazing services—Mapperley Hospital, Nottingham—"Our biggest problem is to keep the outside population from coming in, not the patients from getting out."

Let us examine some of the more important concepts involved in the administration and operation of the open door hospitals. Last summer, I spent a couple of weeks visiting a number of the most advanced units in England: Mapperley, Littlemore,

* Sir Thomas Clifford Allbut, M.D., F.R.S., *Lister* in Encyclopedia Britannica, (XI Edition), Vol. *16*, p. 778.

Horton Road, Coney Hill. While they differ in detail from one another (for they are, after all, the creations of their directors), they all hold in common the use of certain broad approaches to patient treatment, which is reducing the number of hospitalized mental illnesses.

I have mentioned the removal of outward symbols of physical restraints: the locks and bars, the straight-jackets and padded cells. This should not imply that the patient may go where he pleases and do as he sees fit. What has been achieved by the staff of these open hospitals is the substitution of an environment in which the patient is considered to be irresponsible and irrational by an environment which views the patient, no matter how ill, to be at least in some degree a rational and responsible human being. Bars and bolts are the visible manifestations of the belief that irrational and irresponsible behavior is the expected norm of those suffering from mental disorders; these manifestations of belief in "madness" apparently elicit "mad" behavior from the patients.

An environment which is organized around contrary beliefs puts an equally heavy psychological pressure on the patient to behave as responsibly and as rationally as he can. And in fact he does. The open hospitals have thus demonstrated that purely psychological measures are as effective in keeping patients in the hospital as are bars, bolts and high walls. In addition they have shown that their approach actively stimulates—rather than destroys—those elements of rational and responsible behavior which are necessary to social existence.

From this new approach to therapy stems a whole series of concomitant activities. First, and as important, is the development of a close working relationship between hospital and community which has already been mentioned. The directors of these hospitals wanted the residents of the communities they served to know what was happening and not to be fearful of what the hospitals were doing. To this end a number of devices have been developed.

At Mapperley, for example, Dr. Duncan Macmillan has

established guided hospital tours for the inhabitants of Nottingham which have been so successful that the city's high schools include it as part of their civics classes, and 16 and 17 year olds now visit the wards in the same manner as they visit the mayor and city council. The effectiveness of this public relations work can be seen in the following exchange which took place between two youngsters standing by Mapperley's main gate watching the destruction of the old brick wall which enclosed the grounds.

> "Lumme," said the first. "Look what they're doing to the old looney bin!"
>
> "T'aint a looney bin," corrected the second. "Its an 'orspital."

At Littlemore, the weekly social events at the hospital—such as games, dances, movies, etc.—are open to the community, and the townspeople are encouraged to attend. In addition, the nursing staff has stimulated the formation of a group of volunteers who lend a hand by taking care of patients who are without relatives, or who are lonesome. These volunteers "adopt" a patient, visit him in the hospital and take him out into the community. In this way, not only does the patient feel that somebody cares about him, but the community gets to care about what happens to the patient.

Thus wherever the patient goes he finds a supportive environment, yet one designed at the same time to bring out his abilities. Life on the wards, patient meetings, visitors from the community, visits to them—all constantly impress upon him that he is part of a group from which he can draw strength, and to which he himself can offer something: help for other patients sicker than himself, help for the staff, help in various operations around the hospital, etc. One of the most effective ways that has been found to bring out patient abilities is a meaningful program in occupational therapy.

I believe that one of the reasons for the phenomenal progress that the open door hospitals have had in combatting mental illness is their unique system of occupational therapy which I encountered wherever I went.

Much ingenuity and effort is spent by these hospitals in developing programs which stimulate the interest of patients and prepare them for work when they return to the community. The row of listless patients sitting disconsolate upon benches which is the hallmark of most mental institutions is not to be found here. At Coney Hill, for example, Physician-Superintendent Dr. D. L. Walker has contracted to salvage parts from obsolete telephones for the Post Office, which runs England's telephone system. Patients are paid three cents an hour to dismantle 'phones and sort the components into piles. The program was designed for some 100 chronic patients, many of whom were utterly incapable of caring for themselves before the program started but who now are found to take an interest in what is going on around them. At Littlemore, Dr. Bertram Mandelbrote, the Physician-Superintendent, succeeded in getting a Welsh manufacturer of stuffed animals to organize a quasi assembly line in the hospital rather than build a subsidiary factory in France. Groups of psychotic patients stuff cloth "carcasses" with foam rubber scraps, after which they sew up the mid-sections and put on eyes, noses and tongues. Thirty-six dozen toys are shipped out each week.

Communication between staff and patients is considered to be essential by these open hospitals and is stimulated in a number of ways. The chief male nurse at Littlemore attributes the hospital's success in the past year to the improved system of communication which has been established between patient and staff at all levels. "Formerly, the right hand didn't know what the left hand was doing. This is all changed now. Everyone has a say in what goes on." There are frequent patient meetings to plan improvements usually attended by a member of the staff who serves as recording secretary. Here are the minutes for a meeting which took place during July, 1960.

> The garden was the first to be discussed. It was reported that 'casual' labor had produced a good crop of weeds. The 'casual' laborers ignored this. Miss ———— asked why the porters had to be given breakfast on this ward: it was most inconvenient

> at 7:00 a.m. This was generally agreed upon with great feeling, George ———— demanding to have the door locked to keep them out. Mrs. ———— who comes from the Ashhurst Clinic to help in the ward was voted 'tops.' Our Georgie shouted, 'Yes, worth 20 of these 'ere others.' The meeting was then brought to an abrupt ending by Miss ———— delivering the evening papers, [and] who, seeing a ready-made audience, threw her arms in the air and shouted, 'To be or not to be. . . .'

Whether or not this improves hospital administration, there is no doubt that these meetings help to bring staff and patients closer together and into a better understanding of one another.

So far I have emphasized the work that these open hospitals have been doing within their own grounds. But it has been estimated that at least half of the staff's time and energies are spent in the community since the hospitals consider themselves to be but one unit in a chain of psychiatric services. This chain links together pre- and post-hospital services, including peripheral outpatient clinics, halfway houses, day-care centers, night hospitals, and the community's own local health and social welfare services.

While at Mapperley, I had an excellent opportunity to observe this cooperation at firsthand. I was in with the Medical Superintendent, Dr. Macmillan, when he received a call from the city's chief psychiatric social worker to consult with her on a geriatric case. The three of us went to visit an old man in a dingy, cluttered apartment in the working class district on the edge of Nottingham. It was a pathetic case. He had lost his wife some years before, and now that age and loneliness were taking their toll he was showing signs of mental deterioration. Though one of his married daughters lived next door, she could not spend much time with him, for she had to support her invalid husband. There was a second daughter, but she lived on the other side of town and was able to see him only once a week to do his laundry. Without family attention, he was not able to cope with his infirmities.

I was interested to watch how Dr. Macmillan quickly put

his patient at ease. He spoke quietly, trying to gain the confidence of the oldster, working his way through a succession of seemingly innocuous questions which finally led to the pivotal query which was used to test the old man's memory. "What day of the month is it?" Dr. Macmillan asked without a change of expression. And when the old man looked bewildered and found it impossible to answer the question, we knew the flame inside was beginning to flicker and with that the conversation ended. As we left the house Dr. Macmillan whispered into my ear that the old man would not last more than a couple of months. Should he have to be hospitalized however, the hospital would now be prepared to care for him since it would have a treatment plan ready.

The day care center is another significant social contribution in the development of this chain of psychiatric services and Nuffield House, in Nottingham, is a good example of this type of unit. Five days a week some 60 men and women from all parts of the city are brought to the House in the morning and returned to their homes in the afternoon, in a small bus. Juice in the morning, tea in the afternoon, and a hot lunch are included in a ten cent daily charge. Only one-third of the group are former hospital patients, the rest are merely lonely old people. The House provides a bright atmosphere where older people can talk to persons of their own age and where they can find some light work to occupy themselves: basketry for the men, and knitting and weaving for the women.

Almost equally important benefits are those given the young people by having the oldsters out of the house for a few hours a day—a great help in preventing tensions.

The final, and perhaps the most significant development of these open hospitals, has been their insistence upon and their ability to maintain continuity of patient care along the entire length of this chain of psychiatric services. The importance lies in two different areas. The first is the purely medical innovation of recognizing that there is a necessity for maintaining key parent-staff relationships from the moment a person in trouble is

first seen to the day he is left to lead his own life in the community. The second is the ability to sustain these relationships in the face of divided authority and multiple-service agencies.

The conviction that continuity of care is the heart of the open hospital system is voiced everywhere. Dr. Mandelbrote at Littlemore states: "From first to last, the patient should have the same consultant." At Coney Hill, Dr. Walker contrasts the days in which the patient was almost heedlessly shot out into the community for lack of adequate aftercare services, contrasting them with today's elaborate programs. "The great problem in psychiatry," he notes, "is continuity of care." The importance which the open hospitals place on de-emphasizing their role is therefore logical. They hospitalize the patient only if he fails to respond to domiciliary care, and then make every effort to return him to the community in the shortest possible time.

In line with this it is interesting to see that Littlemore, as part of its program of planned rehabilitation, has classified its patients according to work skills, and that the staff is held responsible for moving patients to a higher level as soon as their condition makes this possible. Five grades are recognized, ranging from patients physically unable to undertake active work, to part or full-time workers with jobs outside the hospital who are but one step removed from discharge. The efficacy of this approach can be seen in the fact that the declining hospital populations have begun to affect the work force upon which these open hospitals depend for a number of their projects—the stuffed-toy contract, for example, or the construction of a new social center.

Indeed, competition for patient labor among the various services of these open hospitals is beginning to bedevil the staff and can be expected to become increasingly 'serious' as the decline in their populations continue.

As filled as it is with promise, there are a number of drawbacks which impede the extension of these trail-blazing open

hospital techniques to the rest of Britain's mental health services.

As was mentioned previously, continuity of patient care has been developed in spite of the split between local health authority, general practitioner and the open hospital; but the difficulties involved in bridging the gap should not be underestimated. For the nationalization of Britain's health services merely confirmed and formalized the previous separation of medical services. Hospitals—both general and mental—are under the jurisdiction of some fourteen regional hospital boards which are subject to the (national) Ministry of Health, but the Medical Officer of Health derives his authority from powers vested in local government. The general practitioner operates in a limbo between the two. That the local health authority (which is legally responsible for patient care in the pre- and post-hospital phases) and the mental institution (which is charged with supplying all phases of hospital services, whether intra or extramurally rendered) have been able to combine their efforts to produce a true community psychiatric service despite the fact that they operate at two different levels of authority is, I believe, the key factor in the success of England's open hospitals.

The integration of pre-care, hospital care and after-care services takes place, therefore, through the efforts of the personnel involved and not because formal administrative structures further such a system. This jurisdictional split is one of the major roadblocks to the rapid spread of the open hospital system in Britain. Dr. Duncan Macmillan makes his position quite clear: "In my opinion, it would be better to have a single administrative authority caring for the mental patient than to divide the responsibility between the local health authority and the Ministry of Health."

In Nottingham, one of Dr. Macmillan's devices for achieving integration of services is to hold weekly conferences of the representatives of the two agencies. Attending these meetings are the hospitals' medical staff and psychiatric social workers,

the city's mental health officer, his assistant and their mental welfare workers. Dr. Macmillan, as the psychiatric adviser to the Mental Health Service of the city of Nottingham, presides. One of the major functions of the conference, apart from specific case work, is to iron out personal problems that might arise. Thus there might be a complaint from the hospital's medical staff that they had been routed out of bed at three o'clock in the morning to examine a patient who did not require hospitalization. Why did the city's mental welfare worker believe hospitalization was necessary? The result is that the psychiatric services in Nottingham are so closely integrated that one can hardly separate the work of the two authorities and say where the one begins and the other leaves off.

Another administrative problem which is hampering the operations of these open hospitals concerns the basis for calculating the salary scales of hospital staff. Under present regulations—drawn up at a time when the implications of the open hospital were not foreseen—the salary of senior personnel is commensurate with their responsibility as measured by a number of variables. Chief of these is size of hospital in terms of the number of its patients, the number of beds, etc. Since the open hospitals are successfully decreasing their hospitalized patient loads, such key staff members as the chief male nurse, the matron, the finance officer, the chief engineer are, in effect, working to cut their own salaries! Dr. Walker has estimated that the present trends at Coney Hill and Horton Road Hospitals will eventually cut the salaries of his two chief male nurses in half. Whether the Ministry will act in time to prevent the open hospitals from losing key personnel remains to be seen. In any case, it seems clear that the national government will have to set up a different basis for rewarding skills, effort and responsibility, or face either a staff rebellion or the consequences of Parkison's Law that "Work expands to occupy time available for its completion."

The magnitude of this decline in the resident population of the open hospital can be seen from the 1959 operating statistics

of Mapperley. When Dr. Macmillan first went there, Mapperley had a complement of 1,300 beds. In 1959, only 940 were in use. Of these 940, 550 beds were used for long-stay patients —those who had been in the hospital for more than a year— while the remaining 390 beds were used to take care of the 1,710 short-term patients (patients who remained in hospital for less than a year). During this year, the hospital discharged 1,745 patients, 1,601 alive, and 144 dead. Dr. Macmillan points out that during the next 20 to 30 years, the 550 beds currently used for long-stay patients will no longer be needed: the patients in them will have died. Thus the hospital, which once required 1,300 beds to serve its community will need only between 400 and 500 beds to do a better job for a more populous district.

Such data as these have caused Britain's General Register Office to lower the official estimates on the future needs for mental hospital beds from the current ratio of 3.4 per 1,000 of population to 1.5 in 1976. This by no means should imply that new construction will cease. On the contrary. Dr. Geoffrey Tooth, Senior Medical Officer in the Ministry of Health, says that current plans call for the development of three different kinds of psychiatric facilities: new short-stay psychiatric units in general hospitals for patients who do not require more than three months hospitalization (about 70 per cent of all annual admissions); new medium-stay rehabilitation units containing between 100 and 200 beds apiece; and finally, replacement or reconstruction of present facilities for the long-term care of patients requiring hospitalization for more than two years (about 4 or 5 per cent of all admissions).

The Ministry realizes clearly that these forecasts are subject to change. "We know we're in the middle of a revolution," Dr. Tooth was careful to point out. "The rate of progress is almost impossible to estimate." All that can presently be said with certainty is that a number of the new short-stay units in general hospitals will be in operation sometime this year. (For example, the Sheffield Regional Hospital Board, under which

Mapperley operates, plans to add twelve such units of 100 beds each to the general hospitals under its jurisdiction).

The freedom of the British Physician-Superintendent to experiment unhindered by higher authority has been contrasted to the disadvantage of his American counterpart, both by British superintendents visiting this country as well as by some of the American mental hospital directors who have toured England's hospitals. Dr. Mandelbrote, for instance, believes that there is a lack of local initiative in America; that American hospital directors will not take responsibility for new programs until ordered to do so from above. He contrasts this with the administrative flexibility which the British superintendent enjoys, since he does pretty much as he pleases within the board policies set forth by the Ministry and Regional Board.

Another criticism voiced of American state mental hospital systems is the heavy burden of administrative duties which is placed on the hospital director. The director has little, if any, time for clinical work because of housekeeping chores; this is in contrast to his British counterpart, who, it is claimed, divides his time equally between the two. (Indeed, Dr. Walker of Coney Hill believes he spends as much time on clinical practice and in consultation as the two senior members of his psychiatric staff who have no administrative responsibility for the operation of the hospital.)

The last major criticism which these English open hospital superintendents voice about American state hospital systems is the size of their individual units. Quite apart from the administrative and organizational problems of attempting to relate the hospital to a very large service district, the British direct heavy criticism at the lack of individual attention given patients in the large hospitals. The very size of these units does not permit the patient to have any close personal contact with the psychiatrist, whose time is spread very thinly over a large number of patients. Indeed, in some hospitals it is possible for a patient not to see a psychiatrist more than once a year. This,

of course, would be impossible in England's small open hospitals, where the patients are organized into small groups which are continuously under active treatment.

Is it possible, from the foregoing observations, to develop a better program of psychiatric services than is now currently found in the United States? I vehemently believe so, for I see vast opportunities in two areas alone—the first administrative, the second legislative.

Administratively, these trail-blazing British open door hospitals have shown that they are likely to reduce the number of institutionalized patients by one-half over the next generation through establishment of a system which focuses efforts on continuity of psychiatric care rendered in a psychologically therapeutic environment. While the originators of this system (such as Dr. Macmillan in Nottingham and Dr. T. P. Rees in Croydon) put their programs into effect slowly for fear of arousing public outcry and censure, such extreme caution has been shown to be unnecessary; Dr. Mandelbrote, after indoctrinating his staff, was able to place Littlemore on an open door footing in a period of six weeks. Since most of our state systems are hierarchically structured, and since our hospital directors are used to playing a more passive role than their British counterparts, it will fall to the commissioners of the various state departments of mental hygiene to initiate the needed administrative reforms. Among these will have to be various experiments aimed at overcoming two major problems occasioned by past American hospital practices—the great size of the units involved and the distant location from centers of population.

However, a number of the defects apparent in America's psychiatric services will require changes in our laws governing the care of the mentally ill. Here again we can learn much from our English cousins. Thus, when we come to reorganize present services so as to achieve continuity of psychiatric care, we can avoid the folly of establishing divided authority. It seems clear to me that we will have to spell out statutorily

the duties and mutual obligations of the three major sources of care—the state mental hospital, the psychiatric unit of the general hospital and the community mental health clinic. This will be no easy task, for each of these services operates within a different jurisdictional framework. In New York State, for example, the state mental hospital is a public institution operating within the jurisdiction of the Department of Mental Hygiene. The psychiatric unit of the general hospital, on the other hand, is a private institution which tends to distinguish itself sharply from the government. In between stands the community mental health clinic which, while locally based and locally operated, has financial ties with and professional standards set by the state. Its professional staff and civilian board members tend to identify more with the voluntary agencies than with government. In the type of patients they will accept, the type of services they will render and the formal relations they establish with other agencies, the clinics are at present more like the psychiatric units of general hospitals than the state's mental hospitals. Enabling legislations will not cause these seperate elements to coordinate their activities. However, it can encourage their cooperation on pain of losing state aid.

The English have shown that the disabilities of divided authority can be overcome if a staff has the determination, the enthusiasm and education to coordinate its activities. Such an orientation is the primary component of a successful community psychiatric service and must be pressed for by every means possible.

One statutory innovation which the English incorporated in their 1959 Mental Health Act might well be considered for American import. Early actions had permitted superintendents to "de-designate" some of their beds; that is, since these beds were no longer designated as mental hospital beds, superintendents could admit patients to them without any form of certification. This did away with "voluntary certificates" which were a form of contract between the patient and the hospital. Patients were free to enter and leave the mental

hospital exactly as they would a general hospital and with as little fuss.

In 1959 the new legislation completely removed the legal distinctions between mental hospitals and other types of hospitals. This means that the procedures for admission to all types of hospitals are identical, and that the few patients who need the authority of an involuntary certificate are certified. These certificates are equally useful in sending a patient to any type of hospital, mental or general. The purpose was to avoid the unpleasant and frequently unnecessary formalities of certification and will, it is hoped, be another step in transforming the public image of the mental hospital.

In summary, it is apparent that in some communities the English have devised a pattern of psychiatric care which in a number of respects is an improvement on the patterns currently in use in the United States.

We can learn much from them, both as to elements which might feasibly and profitably be incorporated in our state systems of law and administration as well as to what pitfalls to avoid.

If our mass media are any indication, there is a growing popular interest in mental health programs. This interest should be tapped and guided to spur the development of better psychiatric care for the mentally disordered. Perhaps we, too, are on the threshold of a revolution.

THE NEXT FORTY YEARS IN PUBLIC HEALTH

THOMAS McKEOWN, M.B., PH.D., F.R.C.P.[1, 2]

INTRODUCTION

ALL prophecy is hazardous, and we may begin by enquiring whether predictions concerning trends in public health are likely to be of value if attempted for more than very short periods. Would it have been possible in 1860, for example, to have anticipated either the rate or direction of developments in the second half of the 19th century?

The answer to this question is not encouraging. At that time no one could have been certain of the profound impact of the sanitary revolution on the death rate. No one could have foreseen that the birth rate would begin to decline, and so compensate for the effect of reduced mortality on population growth. And in the field of curative medicine it would have been impossible to predict the advances brought about by the discovery of anaesthesia and antisepsis, or that improved hygienic standards would at last enable patients in hospital to die from the diseases for which they were admitted.

It can hardly be doubted that the changes of the next forty years will be even more rapid and complex than those of the past hundred. Unless as a result of some undesirable development—for example the destructive use of atomic power—it seems unlikely that we shall see any change in the spectrum of mortality as dramatic as that which resulted from control of infectious disease. But we have scarcely begun to make an impact on many forms of morbidity, particularly in the field of mental illness. Methods of investigation and treatment of established disease will become incomparably more complex and, it may be hoped, considerably more effective. And it will

[1] Professor, Department of Social Medicine, The Medical School, Edgbaston, Birmingham, England.

[2] This paper was presented at a seminar held by the Centre for Urban Studies at University College, London, and is one of a series to be included in a forthcoming book entitled "Public Health in a Changing Urban Context."

probably be necessary to make radical changes in the National Health Service, which still reflects origins in a period when most medical services were privately financed.

Nevertheless, there are some reasons why anticipation of future trends may be somewhat less hazardous now than a hundred years ago. First, national statistics have been available since 1840 and provide a numerical base which is being increasingly supplemented from other sources. Second, we have a very much better grasp of the nature of disease processes, and even where we are still relatively ignorant we have some knowledge of the nature of the problems and of the possible direction of future enquiry. And third, the long-standing argument about public and private finance of medical services has been settled and attention can be focused on the form of the service.

Even with these advantages, however, it seems essential that we should set limits to the field of discussion and acknowledge some of the obvious hazards which may make nonsense of our predictions. First as to restrictions. The term public health is commonly used in one of two ways. Traditionally it refers to those health problems and services with which public authorities were concerned in the 19th and early 20th centuries; that is, with the environmental and personal health services provided by local authorities. For many people this usage, which excludes the curative services, has survived the creation of a comprehensive service. There are others, however, who interpret the term literally, to embrace all matters which may affect the public health. These include not merely the preventive and curative medical services, but any agent which now or later can be shown to have an influence on health. For the present purpose the first definition, restricted to the work of local authorities, is too narrow; and the second, which has no obvious limits, is too wide. In the discussion which follows we shall consider the problems of public health reflected in morbidity and mortality, and the medical services designed to deal with them.

The second restriction is related to the problems and services of the British Isles, which are in many respects characteristic of the developed countries. Trends in underdeveloped countries are of the greatest interest, and may have a profound impact on problems elesewhere. But a discussion of the future of public health at a world level would be too ambitious.

Next, as to the difficulties. Since speculation is inevitably limited by existing knowledge, or by conceivable extensions of existing knowledge, it may be disturbed by future developments of which today we know nothing. No prophet at the beginning of the 18th century could have anticipated the industrial revolution with its profound impact on mortality and population growth. In the early 19th century, when the true nature of infectious disease was scarcely suspected, it would have been impossible to foresee the discovery of bacteriology and antisepsis which transformed the work of hospitals. And at the beginning of the present century a critical observer, confronted with the fact that vaccination against smallpox was the only specific measure which had much effect on mortality, might have doubted whether "curative" medicine could be expected to extend its usefulness beyond palliation.

But even from present knowledge it is not difficult to suggest possibilities whose effects on public health are quite unpredictable: the use, even the peaceful use, on a wide scale of atomic power; the creation of living things from inorganic matter; contact with other planets, and possibly with other forms of life. Moreover, examples need not be restricted to the realms of space fiction. It is not unlikely that it will become possible to determine sex by separating the two types of sperm. (The effect on public health may depend upon whether the means of doing so is expensive and restricted to governments, or cheap and available to the general public at the chemist's shop. Recent history does not make it certain that the former would be preferable.) There is also the ominous possibility of the return in virulent form of infectious diseases which are now either uncommon or trivial. In some cases, such

as cholera and typhoid, this risk is probably negligible because their disappearance has resulted from human intervention and the means of spread is well understood and controlled. In other cases, such as tuberculosis, the decline appears to have been secondary to a general advance of the standard of living and again no reverse need be feared. But in still other examples, such as measles, scarlet fever and influenza, the present trivial nature of the diseases appears to have been independent of human intervention and it is by no means certain that they will not occur again in virulent form, or that if they do so they can be effectively controlled. Another influenza epidemic like that of 1918 is only one of a number of unforeseeable events which might profoundly affect public health.

Another difficulty is that the development of services is not always logical, so that what should happen—if logic were the only consideration—is not necessarily what will happen. For example, the views about the medical services expressed in the Minority Report of the Poor Law Commission in 1907 appear in retrospect to have been broadly right. It was recommended that in extending public responsibility, then limited to control of the environment, into the field of personal health, the opportunity should be taken to create a comprehensive medical service publicly financed and controlled. In response to pressure from various sources the extension was restricted to personal health services of a preventive character, a decision which established prevention of disease as a public responsibility and cure as a private one. Nearly forty years later a comprehensive public medical service was created; but the preventive and curative services are still separated in consequence of the decision to reject the advice of the Minority Report of the Poor Law Commission.

In time, many such errors are no doubt corrected. But even when predictions are proved to be essentially correct, estimates of time-scale may be hopelessly wrong. The Webbs' judgement about public provision for relief of need was sound, but they could not have foreseen that it would take nearly half a century

to replace the Poor Law. There are parts of the world in which Malthus's expectation about the relationship between resources and population growth is now being fulfilled, but it did not occur in Great Britain because in a literate society, even without the widespread abstinence which he recommended, other means of limiting family size were utilized.

The discussion which follows is divided into three parts. The first examines the problems which may confront us, in the light of existing knowledge of the principal causes of morbidity and mortality. The second part is concerned with the methods which will be needed, having regard to conclusions about the nature of the problems. We enquire to what extent advance may depend on control of inheritance and whether in man such control is possible or desirable. An attempt is also made to evaluate the importance of the major classes of environmental agents. Finally, in the third part we consider the future organization of the medical services. The present day services are examined critically in relation to contemporary needs and suggestions made about the ways in which they may be changed.

1. Problems

As stated previously our examination of future problems will be restricted to consideration of mortality and morbidity. For the former the main sources of information are the national mortality statistics established in the nineteenth century. For the latter, except in the case of the small number of notifiable diseases, the available data are still scanty, and we must rely largely on inference from the behaviour of mortality.

MORTALITY

As a preliminary to assessment of the future problems associated with mortality we shall examine its relationship to age. From national life tables it is possible to estimate the proportions of liveborn individuals expected to die at stated ages, but this of course gives no information about pre-natal

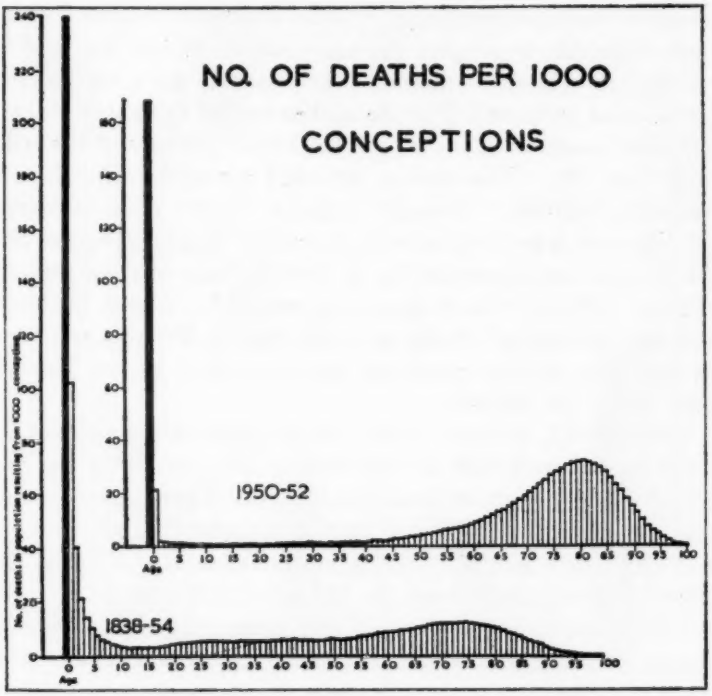

Fig. 1. Per 1000 conceptions (females only), the number dying before birth and at each year of life according to mortality data for 1838–1854 and for 1950–1952.

mortality. For the present purpose it is essential to begin at conception. The difficulty in doing so is that there are no accurate estimates of the frequency of abortion, particularly in the early months of pregnancy. Published estimates vary from 15 per cent to 45 per cent, and in Japan the incidence is even higher than this range at the present time.

Fig. 1 shows the relationship between mortality and age for females in 1838–54 and in 1950–52; it gives the number of deaths before birth, and in each year of life after birth, per 1000 individuals conceived at each of these two periods.[3] (The

[3] T. McKeown. The data given in this section are taken from "Priorities in Preventive Medicine." Harvard, The Cutter Lecture, 1960.

trend of mortality with age in males is similar; it was considered preferable to restrict the examination to one sex, and in relation to selection—discussed below—the data for females are of most interest.) For the earlier period the abortion rate has been assumed to be 200 per 1000 conceptions and the stillbirth rate, 50. (The earliest recorded national stillbirth rate was 40 in 1927–30.) Probably both are conservative estimates, but the error is unlikely to be large enough to alter substantially the distribution shown in Fig. 1. On the basis of these figures, 760 per 1000 individuals conceived would have been liveborn, and the number of deaths in each year of life was obtained by applying to this total the data provided in the English Life Table for 1838–54.

For 1950–52, we have taken the abortion rate suggested by the Royal Commission on Population (150 per 1000) and the actual stillbirth rate of these years (21). These rates suggest that approximately 832 per 1000 conceptions were liveborn, and subsequent mortality was again estimated by applying the information obtained from the life tables for 1950–52.

The figure shows the remarkable change in the age distribution of mortality which has taken place during the past century, of which the main features are the well-known reduction of mortality in early post-natal life, and the greater number of deaths in late life. (It is scarcely necessary to emphasize that the figures show the number of deaths per 1000 conceptions, and do not give mortality rates at stated ages.)

In order to examine the relationship between mortality and selection, numbers of deaths (per 1000 conceptions) have been estimated for four periods: pre-natal and neo-natal; pre-reproductive (from 1 month to age 14); reproductive (age 15–44; and post-reproductive (age 45 and over). In estimating pre-natal and neo-natal mortality for 1838–54 we have used the same abortion and stillbirth rates as in Fig. 1. Neo-natal mortality (deaths in the first month of life) which was not of course recorded at that time in national statistics, has been assumed to be 80 per cent of the stillbirth rate (which it has been

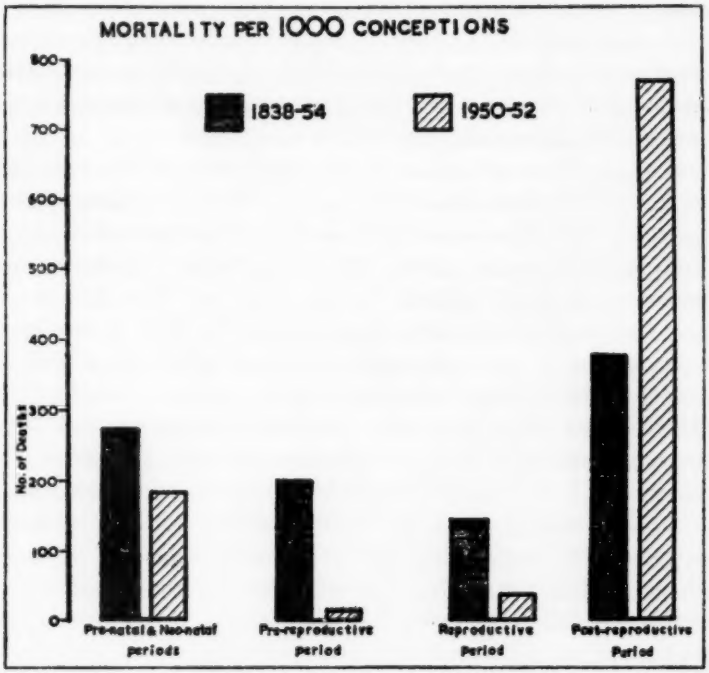

Fig. 2. Number of females dying in four broad periods of life per 1000 conceptions compared for the years 1838–1854 and 1950–1952.

—approximately—during the years for which it has been recorded). For 1950–52 we have used the same stillbirth rate as in Fig. 1, and the stillbirth and neo-natal mortality rates recorded in national statistics for those years.

The striking features of Fig. 2 are (a) the relatively small reduction of the number of deaths in the pre-natal and neo-natal periods; (b) the marked reduction of deaths in the pre-reproductive and reproductive periods; and (c) the increase in deaths in the post-reproductive period. Let us now consider these three age periods in turn, and, for reasons which will emerge from the discussion, in reverse order.

(a) *Deaths in the post-reproductive period.* Since we are considering numbers of deaths per 1000 conceptions, it is

evident that the striking increase in mortality after the end of reproductive life is attributable primarily to improved survival rates in the earlier periods. This evidence does not justify any conclusion about the trend of mortality rates within the post-reproductive period.

Haldane drew attention to the significance of the fact that whether a lethal condition is subject to selective pressure turns upon whether it is manifested before or after the end of reproduction. If it occurs before, affected individuals either do not reproduce, or have reduced fertility (because they do not survive to the end of the reproductive period). If it occurs after, reproduction is complete and unaffected unless the condition is also associated with a physiological reduction in fertility. Hence many diseases of late life, such as cancer and heart disease, occur when they do because they are not affected by selection. If this interpretation is correct, and it has not been seriously challenged, it follows that the influence of inheritance must be very much more significant in the aetiology of causes of death after the end of reproduction than in the incidence of those which occur before. It seems unlikely, therefore, that we can expect any profound change in the extent and causes of mortality in the post-reproductive period to result from modification of the environment. It could be affected seriously only by selective breeding. In the discussion of methods (below) reasons are given for thinking that this procedure is unlikely to be widely used in the foreseeable future. We are likely, therefore, to continue to be confronted with the problems associated with a high incidence of "degenerative diseases" in the post-reproductive period.

(b) *Deaths in the pre-reproductive and reproductive periods.* Perhaps the best support for Haldane's thesis is the behaviour during the past hundred years of mortality after birth and before the end of reproductive life. In the pre-reproductive period (to age 14) it has been reduced to a small proportion of the level in 1838–54, and in the reproductive period there has also been a substantial, though smaller, reduction. In

relation to selection the significant fact is that these changes have been brought about by manipulation of the post-natal environment, chiefly by specific measures such as environmental sanitation, and by the favourable trend in the standard of living. The reduction of mortality is almost wholly due to the effect of these changes on the incidence and virulence of infectious disease. In the light of this experience, and in accord with Haldane's interpretation, it seems justified to conclude that the high level of mortality during the nineteenth and earlier centuries in the pre-reproductive and reproductive periods was determined by an unfavourable environment, rather than by undesirable genes.

For the same reasons it seems justified to conclude that there is further scope for reduction of mortality in middle life (Fig. 2). There is now evidence of the influence of atmospheric pollution and smoking on chronic bronchitis, of smoking on cancer of the lung, of diet and exercise on coronary artery disease. It seems probable that these and other influences will be brought under control, and that in consequence death will be uncommon after birth and before the end of reproductive life.

(c) *Deaths in the pre-natal and neo-natal periods.* In considering together deaths in the pre-natal and neo-natal periods we are attempting to identify, so far as present knowledge permits, early deaths determined by causes operating before birth. All abortions and stillbirths are of this type, and when infant mortality is approximately 20 per 1000 livebirths (as in England and Wales today), so too are nearly all neo-natal deaths. There are, of course, many deaths in later life which are also influenced by events before birth (indeed to the extent that inheritance is involved this is true of all mortality). But with few exceptions it is only in respect to deaths before and immediately after birth that we can say confidently that the post-natal environment has had no effect.

With due regard for uncertainties about abortion rates, and in the nineteenth century about stillbirth and neo-natal mortality rates also, it seems permissible to conclude (a) that there

has been a considerable reduction, of pre-natal and neo-natal mortality and (b) that the level is still high (Fig. 2).

In assessing the possible future trend of this mortality our main task is to come to some conclusion about the relative contribution of inheritance and the pre-natal environment. It is now well recognized that neither intra-uterine nor early post-natal deaths can be assumed to be exclusively of genetic origin and that both inherited and environmental influences are usually concerned. Indeed, there are reasons for thinking that pre-natal mortality is largely attributable to the uterus which, far from being the haven suggested in the psychiatric literature, is the most dangerous environment to which the individual is exposed between conception and death.

The main grounds for this view are the considerations referred to above, namely that because the affected individuals do not reproduce, lethal conditions manifested before or during reproductive life are subject to the effects of selection. The trend of mortality in early post-natal life in response to environmental change is the best evidence for this effect, and there is no reason to suppose that it operates less powerfully before than after birth.

Let us now summarize our conclusions about future trends of mortality. It seems probable that we shall see the virtual disappearance of deaths between birth and the end of reproductive life and this will mean that most individuals conceived will die either before birth or after reproduction is complete. (This is more or less the present position.) In the pre-natal period the problem is largely environmental in character, which is to say not that genes are unimportant, but that if the environment could be controlled it would to a considerable extent be possible to prevent their lethal effect. (The circumstances are the same as formerly in respect to infectious disease: heredity undoubtedly had a profound effect on response to infection, and hence on mortality, yet control was established by environmental change.) Our success in preventing pre-natal mortality will turn both upon ability to discover

the nature of pre-natal environmental influences, and upon whether they prove amenable to control.

The problems associated with mortality after the reproductive period are entirely different. While there is unquestionably further scope for reduction in incidence (chronic bronchitis, coronary disease and cancer of the lung have been mentioned as examples of diseases susceptible to preventive measures), it seems unlikely that most deaths attributable to the so-called degenerative diseases can be prevented. If this is so we will continue to face the problems of care which these diseases impose.

MORBIDITY

Because adequate records of past trends are not available we can speak with even less confidence about morbidity. We shall consider three subjects: congenital malformations; morbidity during the pre-reproductive and reproductive periods; and morbidity in the post-reproductive period.

(a) *Congenital malformations.* Although they are also an important cause of death, congenital malformations can be discussed conveniently in relation to morbidity. Published estimates suggest that approximately 3 per cent of total births (livebirths and stillbirths) have a structural abnormality.

Many are, of course, of a relatively trivial character. About half survive to age 5, so that congenital malformations are evidently an important cause of morbidity and disability as well as of mortality.

There is no evidence that the incidence of malformations is declining, and in view of the reduction of other causes they are becoming relatively more important. We have little precise knowledge of their aetiology, and in predicting future trends must rely largely on the general considerations referred to in relation to pre-natal deaths. Although malformations are clearly attributable to the interaction of inheritance and environment, there is reason to believe that some of them could be prevented by modification of the environment. The grounds

for this view are, again, that lethal conditions manifested before the beginning of reproduction, whether before or after birth, are profoundly affected by selection. We also have more direct evidence in respect to one agent—rubella—as well as indirect evidence in the variation in incidence of many malformations in relation to maternal age, parity, season of birth, social class, geographical area and secular trend.

(b) *Morbidity in the pre-reproductive and reproductive periods.* In spite of the low level of mortality there is still a relatively high level of morbidity in these two age periods. In some cases, such as accidents, the causes are known but difficult to control. In others, such as the common cold, in spite of much research the causes are still obscure. Many infections of childhood are undiagnosed and, on existing knowledge, are probably undiagnosable. There is also a considerable amount of morbidity and disability in middle life, associated with diseases such as chronic bronchitis, rheumatoid arthritis and heart disease. It is not unduly optimistic, however, to believe that there will be a substantial reduction of morbidity from most of these causes: of accidents by precautions on the road, in the home and at the place of work; of infections, by further improvements in living conditions and, in some cases such as poliomyelitis, by specific protective therapy; of chronic bronchitis by prohibition of atmospheric pollution; and in several diseases by reduction in the frequency of smoking.

If these predictions are correct the predominant problem of morbidity which will confront us is mental disease. There is no evidence that the incidence of mental defect is decreasing. It is possible that improved obstetric services may make some contribution, and that in some forms, as in phenylketonuria, effective methods of treatment may be found. But present knowledge gives little grounds for the view that the problem of mental defect will become less formidable.

It is difficult to anticipate future trends of other forms of mental illness. We are handicapped by limited knowledge of past trends. Mental disease is not often a cause of death, and

hence we cannot, as in the case of physical disease, get much help from knowledge of mortality. We must therefore base our views largely on deductions from the behaviour of physical illness. It seems certain that there has been a sharp decline in mental disease due to infection, malnutrition, alcohol and toxic hazards in industry. For example, in the mental hospitals of England and Wales during the present century the proportion of male admissions due to syphilis declined from about one in five to one in fifty. We can be less confident about the trend of those forms of mental illness whose aetiology is still obscure: schizophrenia, manic depressive psychosis, and psychoneurosis. It is possible that there has been some reduction in the incidence of schizophrenia in response to improved social conditions (since hospital admission for schizophrenia is more common in poor than in favourable social circumstances). There is some evidence that manic depressive psychoses are more common, particularly in women.

But although this balance sheet is by no means wholly unfavorable, we cannot feel complacent about it. We are still very ignorant about methods of preventing or effectively treating mental illness, which is now, and is likely to remain for some time, the predominant problem of morbidity in early and middle life.

(c) *Morbidity in the post-reproductive period.* In order of frequency the common physical causes of morbidity in representative men aged 60 and over are as follows: chronic bronchitis, hypertension, coronary artery disease, peptic ulcer, hernia and osteoarthritis. With some changes in order of frequency the list for elderly females is similar.

At the present time in Great Britain (although not in many other countries such as the United States) chronic bronchitis is by far the commonest disease in this age period, and the one responsible for the highest level of disability. Enough is known of its aetiology to suggest that by control of the atmosphere, reduction of smoking and improvement in the standard of living the disease may become much less prominent. It also

seems probable that as a result of more exercise and changes in diet morbidity from coronary disease may be reduced. Knowledge of the other common diseases is less complete, and we cannot be confident about future trends.

In the field of mental illness it seems inevitable that with an ageing population we shall be concerned with increasing numbers of patients exhibiting changes associated with senility. Such patients are already common, and would be even more conspicuous in mental hospitals were it not that their expectation of life, from the time when they first exhibit symptons, is much shorter than that for patients with some other forms of mental illness.

Finally, there is of course among the elderly a considerable amount of disability, such as defective vision and hearing, not associated with specific disease. Here again, in view of the age trend of the population we have no reason to believe that disability will become less common. What we can expect is that methods of relieving such conditions will become more effective, but in this section we are concerned only with an appraisal of the problems.

2. Methods

CONTROL OF INHERITANCE

When they wish to improve their stocks, plant and animal breeders do not hesitate to control reproduction by selection of one or both parents. Racehorses which stay, delphiniums which do not bend in the wind, cattle with good milk and beef qualities, maize with a high protein content and roses which combine appearance and scent with disease resistance and perpetual flowering, are all attributable to selective breeding. But so far there has been no control of human reproduction, and perhaps the most important question related to methods which may be used in future to improve health is whether it is likely that the measures, hitherto restricted to the environment, will be extended to inheritance.

It is worth noting that the practice of selection to bring

about improvement in crops and farmyard animals long preceded the establishment of a science of genetics. To farmers who knew nothing of genes and chromosomes it was evidently worthwhile to select parents on the basis of their own characters or of the characters of their offspring. And in practice this procedure has not been greatly altered by the new knowledge of genetics. Breeders of racehorses still assess the value of a sire both according to his own record in competition, and according to the performance of his offspring. The fee for his service is greatly increased if a horse wins the Derby and St. Leger before being retired to stud; it is increased again if some of his offspring also win classic races. Evidently it is not only lack of knowledge which has prohibited application of similar methods to man.

The characters of human beings have of course been affected by selection. In order to reproduce, it is necessary to survive and to be fertile, and ability to do both has been influenced by the environment. Perhaps the most striking example is the selection attributable to infectious disease, which undoubtedly has had a profound effect on human evolution. There is, however, a fundamental difference between this "natural" selection, brought about by "nature red in tooth and claw," and the purposeful selection practiced by farmers. Conscious control of reproduction has had no effect on human evolution, and some people think it remarkable that men have not applied to their own kind the breeding methods which have had such conspicuous success with plants and animals. The reasons for this restraint are important in assessing future trends, and we shall consider them in relation to the three grounds of ethics, effectiveness and desirability.

Ethics. Let us first consider the question: Would it be right to control human breeding? This is an ethical question, and it is scarcely surprising that there is a wide divergence of opinions about the answer. Some people believe that in no circumstances would it be right to interfere with the pattern of reproduction imposed by instinct and the environment, a

viewpoint taken usually on religious grounds. Catholics, for example, believe that fertility should be controlled only by confining intercourse to a "safe period" or by abstention, and naturally take exception to eugenic policies which require more extensive interference with reproduction. There are others who consider that the genetic constitution of the human race is too important a matter to be determined by the irrelevant fact that two individuals happen to take a fancy to one another. They regard the association between the act of copulation and reproduction in much the same way as a breeder of dogs would regard the release of a mongrel among his prize bitches, and suggest that when knowledge and refrigeration permit, human beings should resign their reproductive functions to the laboratory.

These are extreme views. Most people who have thought about such matters take an intermediate position. They do not object in principle to some control of breeding; but they are much concerned about the purposes for which it is to be employed, and about the methods of achieving it. In particular they dislike the use of compulsory powers to prevent reproduction.

Effectiveness. The second question which we must consider is this: Would control of human breeding be effective? If it is to be answered the question must be made more precise. Let us enquire whether it would be possible either (a) to eliminate or reduce the frequency of undesirable genotypes or (b) to increase the frequency of desirable genotypes. In attempting to answer the first part of this question we shall refer separately to the few conditions which appear to be attributable to a single gene, and to the much larger number, including most of the important diseases, which cannot be so attributed.

In the case of conditions due to a single gene, subject to a reservation referred to below, it is evident that the effectiveness of suppressing reproduction depends upon the extent to which it is possible to identify individuals who carry the gene. By preventing reproduction of affected persons it would be possible

to eliminate a dominant genotype, if it is completely manifested before reproductive age in both the homozygous and heterozygous forms. These requirements are more or less met by only a few rare abnormalities, for example achondroplasia, and a certain type of juvenile cataract. In most dominant genotypes the requirements are not met, either because the abnormality is not completely manifested in all environments, or because it does not appear until after reproduction. Huntington's chorea is an example of a condition due to a dominant gene which cannot be eliminated in this manner because the affected individuals may have reproduced before they show signs of the disease.

In most cases the single genes responsible for abnormalities are recessive, and are manifested only in the homozygous state. The number of individuals who carry the gene but are not themselves affected (the heterozygotes) is much larger than the number of affected (the homozygotes). For example only 1 in 20,000 individuals exhibit the condition of albinism (i.e. are homozygous), whereas about 1 in 280 carry the gene but are not affected (are heterozygous). It follows that only a small proportion of affected individuals have affected parents, the suppression of whose reproduction would have relatively little effect on the frequency of the gene. It would be more practical to reduce the incidence of a sex-linked recessive condition, such as haemophilia, but this would require restriction of breeding of daughters and sisters, as well as of the affected males.

So far we have ignored the fact that genetically-determined abnormalities also result from mutation, the reservation referred to above. Mutation is a change in a gene, probably chemical in nature, which sometimes has very undesirable effects. The mutation rates so far estimated in man (for haemophilia, epiloia, achondroplasia, retinoblastoma and aniridia) are relatively low, but they are by no means insignificant. In haemophilia, for example, the frequency of mutation is apparently high enough to maintain the incidence of

the disorder at a fairly constant level, in spite of the fact that most affected males die before reproductive age. It is evident that control of reproduction cannot be expected to eliminate a condition which continues to reappear as a result of mutation.

In the majority of human diseases of greatest interest, however, the genetic background is obscure. What can be said with certainty is, first, that they are not attributable to a single gene, and second, that they are influenced in a greater or less degree by environment. These two considerations make predictions of the effects of control of reproduction extremely hazardous, but in most cases it would probably be small. For example, it has been shown that most mental defectives have parents who are not defective; prevention of reproduction of affected individuals would therefore have little influence on the incidence of mental defect in the general population. In Sweden, although the marriage of persons with so-called idiopathic epilepsy has been illegal for nearly two hundred years the incidence of adult epilepsy appears to be much the same as that in other Western countries.

It is even more difficult to speak with confidence about the possibility of increasing the frequency of desirable genotypes. It would probably be possible to list a number of human qualities which most people regard as desirable: integrity, intelligence, vitality, honesty etc. But even if we accept the possibility of agreement about which qualities are best and the advisability of an increase in their frequency, it is questionable whether it could be brought about. In the first place little is known about the relative significance of inheritance and environment in determining these qualities, and nothing is known about the related genes. If parents were selected with no other object than an increase in stature it could soon be achieved. It is by no means equally certain that the same is true of intelligence, or of the other unmeasured, and perhaps unmeasurable, qualities to which we have referred. Moreover, although cattle are bred with a single purpose such as increased milk yield, or improved quality of beef, no single objective would be ac-

ceptable in man. And it is quite conceivable that improvement of one desirable feature might be accompanied by deterioration of another. In *The Golden Fleece,* Robert Graves refers to an island on which there were many small boys whose shortness of temper and sturdiness of frame identified them as the offspring of Achilles. Confronted with a result of this kind the stockbreeder can mark it down as a failure and try again. The human breeder can scarcely do the same; he must therefore be doubly sure of what he is about before be begins "to finger the levers that control eternity."

We may sum up our conclusions about the possibility of control of human breeding by referring to a statement by a group of well-known geneticists. "At the present level of genetic knowledge we cannot improve the genes with which we are born, and there is little we can do to determine which genes we pass on to our children." Shaw's advice that one should "take care to get born well' is as difficult to follow in respect to genes as in respect to social circumstances.

Desirability. Finally we must ask whether, if it were permissible and effective, it would be desirable to control human breeding. Again the question must be phrased more precisely. No reasonable person is likely to quarrel with the view that if it could be brought about by acceptable methods, and without serious side-effects. the elimination of many genetically-determined diseases and abnormalities would be desirable. But it has also been suggested that it would be wise to increase the proportion of genetically well-endowed people. It is the latter claim which requires close scrutiny.

The belief that it would be desirable to increase the proportion of gifted people pre-supposes that improvement in human affairs is at present restricted by lack of them. It is difficult to accept this interpretation. The fact that human achievement has been remarkably high only in certain places and for short periods—in Italy during the Renaissance, and in England during the seventeenth century, to take two examples—suggests that at most times the environment is unfavourable

for great achievement. (The alternative explanation—that there have been some remarkable mutations at different times in history—is not acceptable.) T. S. Eliot has made the same point in another context, when he refers to periods when the first-class poet can do only second-class work, and the second-class poet cannot create at all. If we accept this interpretation we must believe that in human society there is an immense reserve of ability which is not exploited.

Moreover it is by no means certain that we would know how to use a larger number of gifted people if they become available, or that we should be able to reward them if they could be employed. A large part of the world's work requires little ability, and of a considerable part of the remainder it might be said, as Mr. Raymond Chandler has said of the Los Angeles police force, that it requires good men, but has little in it to attract good men. It is true, perhaps, that there are few jobs which could not be done better by intelligent than by less intelligent people. But if job placement ever becomes a serious international problem, it is more likely to be because many occupations demand ability but do not reward it, than because the general level of ability is too low. The time may come when man's control of the environment is so advanced that there will be little need of people with no more than ordinary capacity. But in the foreseeable future, even if it were possible, modification of the proportion of individuals with different levels of ability might create more problems than it would solve.

CONTROL OF ENVIRONMENT

In relation to health the word environment is frequently used in a restricted sense, to refer to such influences as water, air, food, housing and, sometimes, the social environment. In the light of our discussion of future trends in health problems these restrictions are quite unsatisfactory. We shall therefore use the term as the biologist uses it—in reference to all influences which are not inherited. These include matters as different as

the blood supply to the uterus, the nutrition and health of the mother in pregnancy, conditions during labour, and every kind of post-natal influence, from blood transfusion, vaccination or X-ray, to the density of the air and intensity of traffic on the roads. It will be convenient, however, to deal separately with the pre-natal, intra-natal and post-natal periods.

Pre-natal environment. At the outset it should be recognized that improvement in health hitherto has been due mainly to manipulation of the post-natal environment, and to a lesser extent, of the intra-natal environment. The reasons for this are by no means fortuitous. The uterus is a relatively inaccessible place, in which the foetus is effectively insulated from external influences to which the mother is exposed. The effects of this are two-fold. On the one hand the foetus is protected, —for example, against any but the most severe nutritional deficiencies. But on the other hand, because it is the internal environment of the mother which is important to the foetus, its effects are more difficult to investigate and to modify than those which operate during and after birth. (This is significant in relation to interpretation of the behaviour of the birth rate and death rate in the eighteenth century. When conditions were bad they resulted in an increase in the death rate rather than a reduction of the birth rate because the foetus is protected from the effects of the external environment. And when conditions improved after the industrial revolution, they were first and most sensitively reflected by a decline of the death rate.)

In the previous section the significance of the pre-natal environment was referred to in relation to three subjects: pre-natal mortality; congenital malformations; and morbidity and mortality in post-natal life. It is also possible that it may have an influence on post-natal growth and development, for there is evidence that the growth of the human foetus is frequently retarded in the late weeks of gestation. We do not know whether this retardation has any effect on later development.

At the present stage of knowledge it is difficult to speak confidently about the nature or effectiveness of the methods which

may be used in future to modify the pre-natal environment. To the extent that undesirable influences originate in the external environment (for example infectious diseases, one of which—rubella—has been shown to cause malformations) it should be possible to prevent them. But to the extent that they originate within the uterus (for example, deficient blood supply due to faulty attachment of the embryo) we can be less optimistic. In this context it is worth noting that a considerable number of pregnancies are terminated intentionally by induction of abortion.

The intra-natal environment. It has long been recognized that prolonged and difficult labour may affect the health of the foetus, and injuries inflicted during delivery are still an important cause of infant death. It is perhaps less obvious that conditions during birth may be associated with delayed manifestations of disease. For example, they may be responsible for some cases of mental deficiency, and there is evidence which suggests that foetal asphyxia may lead to persistent patency of the ductus arteriosus, which may remain unnoticed until months or years after birth.

That there is further scope for improvement of obstetric technique is evident from comparison of results obtained by different hospitals. For example peri-natal mortality is substantially lower in Aberdeen than in Scotland as a whole, and this difference is probably due to the excellence of the obstetric services in this city.

The post-natal environment. It is scarcely surprising that effective control of disease has so far depended almost entirely upon the control of the post-natal environment. This has been brought about either by direct interference with the body of the individual—protective inoculations, drug treatment, surgery, etc.—or by modification of the environment in which he lives. We must now try to come to some decision about the relative importance of these two methods in future.

There is little difficulty in evaluating them in the past. With the notable exception of vaccination against smallpox it is

doubtful whether specific therapy, protective or curative, had any measurable effect on morbidity or mortality before the beginning of the present century. There are now a considerable number of preventive procedures of varying effectiveness, against diseases such as diphtheria, tuberculosis, typhoid and poliomyelitis. And since the discovery of insulin in 1920 the range of useful curative measures has been considerably increased. Although these measures have had a profound impact on some individual diseases—tuberculosis, diphtheria, diabetes, pernicious anaemia, puerperal infection—it is doubtful whether collectively they have had much effect on national mortality trends. Nevertheless it seems probable that specific methods of prevention and treatment will become increasingly complex and effective. There are, however, many diseases, including some of the most common ones, on which such methods can have very little influence. Examples are chronic bronchitis, cancer of the lung and rheumatic heart disease. We must therefore continue to look to the possibilities of control of the external environment.

The marked improvement in health since the eighteenth century has been due almost entirely to the decline of mortality from infectious disease. This has been brought about partly by the favourable trend in the standard of living, and partly by the specific measures initiated in the sanitary revolution in the mid-nineteenth century. Is there further scope for improvement in health by the same methods?

Among the features of the external environment whose influence on health is most conspicuous in England and Wales today are the atmosphere, housing, diet, working conditions and road traffic. The effect of atmospheric pollution is evident in relation to mortality from almost all respiratory diseases, including chronic bronchitis, lung cancer and pneumonia. It is reflected in differences between different parts of the same town, between large and small towns, and between urban and rural areas. Indeed at the present time in Great Britain the advantage of rural over urban conditions of life, in so far as it

is reflected in mortality statistics, appears to be restricted to respiratory disease. It seems probable, therefore, that the prevention of atmospheric pollution is one of the most important measures now available to public health authorities.

The relation of housing to health, although less obvious in national mortality statistics, can scarcely be doubted. There is evidence of the effect of crowding on mental illness and on physical illness, particularly from infectious disease. Further improvements in housing can therefore be expected to make a significant contribution.

Although gross nutritional deficiency occurs rarely in Great Britain today, there are two sections of the population whose health may be jeopardized by lack of food. They are old people, and the late children of large families. It is among the elderly that need is most common, and in spite of the resources provided by National Insurance and National Assistance their diet sometimes falls below a reasonable minimum. The deficiencies to which children are exposed are attributable to the fact that the largest families are, in general, the poorest. The late children are exposed to infectious diseases conveyed by their brothers and sisters, at a time when family resources are at a minimum.

During the present century most of the crude toxic hazards associated with employment—mercury, lead, arsenic and phosphorous—have been eliminated or controlled. Nevertheless the standard mortality ratios indicate that there remain substantial risks associated with occupation. Some of the differences are attributable to variations in income, but others reflect the effects of the working environment. One of the most obvious adverse features is the industrial atmosphere, which is still responsible for much chronic bronchitis, and pneumoconiosis. It seems reasonable to believe that in time this type of risk will be eliminated. There will remain the possibility that some of the many new organic compounds which are constantly being introduced into industry will prove to be toxic, and constant vigilance will be necessary to control them.

The risks to health associated with road traffic are already formidable and are likely to increase. All that need be said about them here is that they will not be reduced without a more radical solution of the traffic problem than any which has so far been applied.

We have been considering those aspects of the external environment susceptible to control by public action. One of the most significant features of the measures adopted during the past hundred years was that because their effectiveness did not depend to any considerable extent upon the cooperation of the individual, they could be modified by Acts of Parliament. But during the past decade investigations of the aetiology of disease have revealed a number of environmental influences of a personal character which cannot be controlled so readily by public action. They include the effect of diet and exercise on coronary disease; of alcohol on hepatic function; and of smoking on a number of diseases of which lung cancer has been most discussed. If such influences are to be controlled it must evidently be mainly through educational methods.

3. Services

Although the medical service in Great Britain has been accepted as a public responsibility, its form still reflects its origins in a period when it was largely under private auspices. The main task which now confronts us is to adjust the service, so that in form as well as in finance, it is geared to the changed circumstances. We shall consider the possible changes in relation to the three major divisions of the National Health Service.

HOSPITALS

In spite of improvements in design and tasteful furnishings, the modern hospital is still a forbidding place. It is largely responsible for the widespread impressions that health depends primarily on treatment of the sick, and that therapy is for the most part a highly technical business. For many people "having an operation" is the essence of medical care and surgery the summit of medical achievement.

An interpretation of the reasons for the decline of mortality since the eighteenth century leads to quite a different conclusion. The marked improvement in health is attributable primarily, not to what happens when we are ill, but to the fact that we do not become ill. And the main reason why we do not become ill is because we live in a healthier environment. It is to environmental services and the favourable trend in the standard of living that we are largely indebted for our better health. Medical history, like common sense, suggests that in designing services we should seek to promote prevention of disease rather than its cure, domiciliary rather than institutional care and, within the hospital, a wide range of activities of which complex investigation and treatment of established disease are only a part.

Against this background the hospital should find a more effective and a more modest place. A considerable part of its work should be directed through outpatient and day care towards making admission unnecessary, and by an intimate relationship to domiciliary practice towards making it possible to retain the personal character of the medical services which the predominance of the hospital now threatens. Services for in-patients should extend from highly technical procedures through a wide range of rehabilitation services to humane hotel keeping. Indeed, the only obligation which remains unchanged through all advances in medical knowledge and changes in the concept of public responsibility, is to care for the dying and to comfort the relatives of the dead.

Many of the problems which confront the hospital service are rooted in the traditional separation of acute, mental and chronic hospitals from one another. These three types are usually on different sites, and when they are on a common site are separately staffed and administered. This sub-division does not correspond to the medical, nursing and social needs of patients, and is wholly attributable to historical circumstances.

Origins of separation of hospitals. Each of the three major classes of patients was presented to society at different times

and as different problems. The object of the asylums was originally to protect the community from the supposed risks of the insane, and the methods adopted for this purpose were penal in character. The object of the Poor Law Authorities was to make admission to an institution a condition of public assistance, and the foundation of hospitals for the chronic sick was an unlooked-for complication of their decision to house the destitute. Until recently it was only in the general hospitals, which inherited the tradition of the voluntary hospitals, that investigation and treatment of disease were recognized as the primary object of institutional care. As a result the three systems were usually established on different sites and were financed, administered and staffed separately.

Disadvantages of separation of hospitals. (a) Mixing of patients with different needs. Since segregation was not based on medical assessment, patients in each of the three classes of hospital were heterogeneous in respect to need. Those in chronic sick hospitals—the mentally defective, the psychotic, the senile, the infirm, the venereally infected and the chronic sick of all ages—had in common only the fact that they were destitute. Those in mental hospitals exhibited the full range of mental and physical illness. And even in general hospitals, isolation from other facilities frequently forced retention of patients not in need of hospital care who were admitted or retained after investigation and treatment primarily for social reasons.

Since 1948, when all hospitals were placed under the same authority, there has been some improvement, particularly in hospitals for the chronic sick. But the mixing of patients with different needs continues, and is indeed unavoidable under the traditional partition which has been retained in the National Health Service.

Recently the needs of all patients hospitalized in Birmingham were assessed, and the table shows their distribution over four classes:

(1) Those needing the full resources of a modern hospital—skilled nursing, laboratory investigation, surgery etc.

(2) Those needing limited hospital facilities, essentially simple nursing care without mental supervision, because of physical illness.

(3) Those needing limited hospital facilities, essentially supervision and training, because of mental illness.

(4) Those needing no hospital facilities, and retained chiefly for social reasons.

This classification is based upon an appraisal of the needs of each patient by the physician responsible for his care. The table shows that there are still substantial numbers of patients in chronic hospitals who need the facilities of acute or mental hospitals, and in mental hospitals who need the facilities of acute or chronic hospitals. Those in acute hospitals are more homogeneous in respect to need.

(b) Difficulties of staffing. Under present circumstances it is impossible to attract enough doctors and nurses to mental and chronic hospitals, where services are, in consequence, far below the standard expected in acute hospitals. So long as the hospitals are isolated they must depend on recruitment of staff prepared to devote themselves exclusively to these services and the difficulties will remain. They can be overcome only by placing the hospitals close enough to the acute hospitals to

Type of hospital facilities needed by all Birmingham hospital patients.

Hospital Group	Total	Hospital Facilities Needed			
		Full	Limited, without Mental Supervision	Limited, with Mental Supervision	None
General and Special	100% (2936)	96.8 (2841)	1.6 (48)	0.5 (16)	1.1 (31)
Chronic Sick	100% (1338)	34.0 (455)	43.7 (585)	16.3 (218)	6.0 (80)
Mental	100% (3555)	12.9 (459)	1.7 (59)	73.0 (2596)	12.4 (441)
Total	100% (7829)	48.0 (3755)	8.8 (692)	36.1 (2830)	7.1 (552)

make it possible for the same staff to serve both. This view rests on the belief that most doctors and nurses would be prepared to make a contribution to the care of the mentally ill and chronic sick, particularly if this obligation were acquired naturally in the course of training. They will not do so if it means cutting themselves off from their main interests.

(c) Artificial division of patients into acute and chronic classes. The present distribution of services gives the impression that patients fall naturally into two classes according to whether they need short term or long term care. This results from the fact that within a few weeks of admission patients in general hospitals are expected to die, to get better or to get out, whereas duration of stay in mental and chronic hospitals is often unnecessarily prolonged because of inadequate services. It is not possible to say what the distribution of patients would be in respect to duration of stay under adequate services, but it is certain that it would be much less conspicuously bimodal than it is today.

(d) Lack of flexibility. Another disadvantage of divided hospitals is that they cannot respond readily to changes in the size and character of the institutional population. For example the isolation of hospitals for tuberculosis and other infectious diseases has made it much more difficult to transfer staff and buildings to alternative use when they are no longer required for their original purpose.

(e) Reduplication of facilities. Independent hospitals must provide a full range of services. Hence it is not possible to economize by pooling resources or to vary the design and equipment of buildings to make them complementary to one another.

Future hospital organization. Let us now summarize the main features which should characterize the hospital if it is to avoid the disadvantages referred to above.

(1) All types of patients should be cared for on a common site in approximately the proportions in which they occur in the institutional population.

(2) The centre should consist of multiple buildings of varied

size, design, equipment and permanence of structure, each adapted to the needs of the class of patients to be admitted.
(3) Patients should be classified strictly according to their medical, nursing and other needs and placed in the unit most suitable for their care.
(4) Medical and nursing services should be provided by a common staff.
(5) The relationship of the hospital centre to the community around it should be much more intimate than hitherto.

The implementation of the first four proposals would result in elimination of two features of the hospital tradition: the segregation of patients according to criteria (acute, mental, chronic) which do not correspond to their medical needs; and the concept of the hospital as a single independent building providing a full range of services. The fifth proposal would lead to a new relationship between hospital and domiciliary medical services.

Fig. 3 illustrates the organization of medical services at the centre. All, or nearly all, inpatients would enter the unit which provides full hospital facilities, and after investigation and treatment most of them would return home. Some, however, although no longer in need of the full resources of the hospital, would require rehabilitation—using this term in the widest sense to include such activities as re-training and learning a new occupation as well as physiotherapy—after which they could return home. Another group of patients whose medical needs or social circumstances prohibited their discharge would need long-term care: washing, dressing, feeding, etc., in the case of the aged; an organized community life in the case of the mentally ill; simple hostel facilities in the case of some patients who could be discharged if they had a suitable home. They might also include patients working in the community while residing in hospital. Finally, there should be day-care of patients treated or cared for during the day while continuing to live at home. If this unit were not available, almost all such patients would have to be admitted as inpatients.

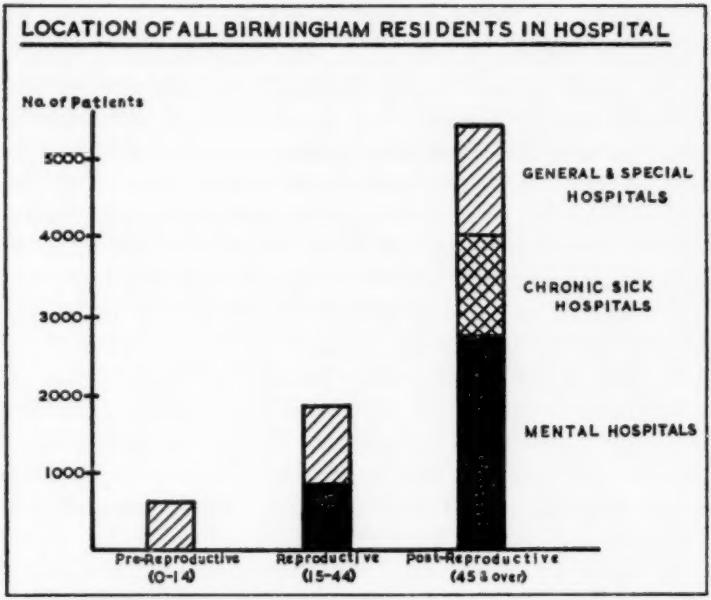

Fig. 3. Number of hospital patients in Birmingham classified as requiring a specified type of hospital service on the basis of a special assessment of need.

We should avoid misinterpretation of the figure by stressing that it is intended only as a diagrammatic representation of services each of which would require multiple units. For example, rehabilitation would require workshops and other facilities for training as well as physiotherapeutic services. Long term care would require wards with simple nursing services for bed-fast patients and hostels for those needing little more than residential accommodation. Moreover it is not suggested that in all units it would be desirable to separate the mentally ill from the physically ill. For example, patients of both types who require only residential accommodation might share the same hostel. The diagram is intended to illustrate the main groups of services, and mentally ill and physically ill patients are shown separately in order to stress that both are fully catered for and, in spite of differences, have common needs.

LOCAL AUTHORITY SERVICES

In Great Britain, as elsewhere, the local authority health services are concerned mainly, although not exclusively, with the prevention of disease. The environmental and personal health services are essentially preventive in character; the after-care and ambulance services deal with established disease. Broadly, however, it is true to say that preventive and curative medicine are under separate local administrations, and are practised by different doctors and nurses. The trend in countries as different as Great Britain, the United States and Russia is unquestionably to keep them apart. The tradition was established early in the century, when public responsibility was extended from environmental to personal health services, but was restricted to preventive procedures. This made prevention of disease a public charge, but left cure a private one. In Great Britain although all services are now publicly financed, the traditional division has been retained.

The disadvantages of this arrangement are self-evident. It is illogical to assign the preventive services for an individual—a pregnant woman, a pre-school or school age child—to one doctor, and the curative services to another. But perhaps the most serious feature of dual administration and staffing is that they make it very difficult to establish a farsighted system of priorities. There are many diseases—chronic bronchitis is an excellent example—for which only preventive measures can provide a satisfactory solution. Yet in the choice between that which is urgent but relatively ineffective and that which is effective but less urgent preference is inevitably given to the immediate problem. If this awkward decision is forced on a common administration, preventive medicine may receive the priority which it merits.

If the future development of health services is rational, it seems reasonable to expect that all medical services concerned with the individual will be brought under a common administration and staff at local as well as at central level. This would mean that obstetricians responsible for deliveries would provide

the related ante-natal services, and that doctors concerned with the sick child would undertake the preventive services, both of a specific and of an advisory character. The work of local authority doctors concerned with ante-natal, child-welfare and school services would be done by general practitioners and consultants.

Such an arrangement would place the division between the personal medical services (of all types) and the environmental services, rather than between preventive and curative services, as at present. It should not mean the end of medical interest in the environmental services. But in many countries of the West these services have now reached a level at which they can be entrusted safely to the supervision of non-medical staff, advised when necessary by medical consultants. Indeed this procedure is already in existence in a few county boroughs in Great Britain.

Any attempt to unify the preventive and curative personal medical services would inevitably raise the awkward issue of the nature of the local administration. In Great Britain it seems very unlikely that hospital, consultant and general practitioner services would be assigned to local authorities. Not the least, but certainly not the only objection, would be the unsuitability of local authority boundaries. The more acceptable arrangement would be to transfer the preventive personal services to the regional authorities concerned with hospital and general practitioner services. This would leave the environmental and welfare services with local authorities.

GENERAL PRACTITIONER SERVICES

The central question concerning the future of general practice is not the personal character of the service or the family basis of practice, but whether a substantial proportion of medical services will continue to be provided outside institutions.

At the present time there are two conspicuous trends in the relationship between domiciliary and institutional services. They are towards isolation of the one from the other, and pro-

vision of all curative services from hospitals or from clinics based on hospitals.

In countries such as Great Britain and Norway doctors are engaged almost exclusively in either hospital or domiciliary work. This arrangement has many disadvantages, of which the most serious is perhaps that it restricts a logical development of services. In obstetrics, for example, there are good grounds for believing that the proportion of institutional deliveries should increase and mean duration of stay in hospital should decrease. With separate administration and staffing of domiciliary and institutional midwifery these developments are impeded. Similarly in the case of the mentally ill and aged sick, patients cannot be divided simply into institutional and domiciliary classes; they require a complex pattern of care which would cut across the traditional boundaries. Yet another disadvantage of separation is that doctors outside hospital tend to lose touch with the technical advances of medicine, whereas those inside, seeing only highly selected patients, may lose touch with reality.

The second significant trend, as yet more evident in countries such as Russia and the United States than in Great Britain, is towards provision of all curative services from hospitals or clinics based on hospitals. Where there is no link between domiciliary and institutional work, and where the means of investigation and treatment are located in hospitals, this trend is almost irresistible, and unless it is arrested general practice as we now know it may become extinct. If health depended mainly on a battery of technical procedures there might be little to regret in this change. Since it does not, there is a strong case for preservation of a personal medical service.

Hence there are two grounds for retention of domiciliary practice. In the first place it is needed for effective mobilization of a wide range of services in which home and outpatient care are at least as significant as inpatient investigation and treatment. And secondly, it is essential for the preservation of the personal character of the medical services.

If domiciliary practice is to survive and take a more prominent part in an integrated medical service it will be necessary to have both a common administration of institutional and extra-institutional services and an important role for the general practitioner in hospital and for the consultant outside hospital.

A common administration. Reasons have already been given for a common local administration of hospitals and of the personal medical services now provided by local authorities. The grounds for bringing the general practitioner services within the same administrative framework are self-evident.

General practitioners and the hospital service. Paradoxically, the most effective means of insuring the continuation of domiciliary practice is to bring the general practitioner into the hospital. His role there must, however, be something more than the coat-hanging, coffee-drinking relationship to the consultant sometimes suggested. In many fields—mental illness, obstetrics, geriatrics, paediatrics and general medicine—there is no reason why he should not take over some of the duties now assigned to full-time or part-time staff. Indeed in some areas arrangements of this kind are already in existence.

If a continuous system of care is to be operated between home and hospital, in which inpatient care is only one, and not the dominant, feature, it is almost equally important that the role of the consultant should be extended outside the hospital. Examples are already available in a few towns where a psychiatrist, in association with general practitioners and the medical officer of health, retains his interests in the mentally sick after their discharge from hospital until they are ready to dispense with psychiatric supervision. Arrangements of this kind should be extended to other subjects and to all areas.

These changes would raise other questions, of which the most important, perhaps, concerns the relationship between a consultant working outside the hospital and a general practitioner working within it. This problem is already evident in obstetrics, where the decision to introduce general practitioner beds threatens to create a second level of consultant work (if the

beds are separated from those which now exist), or will require reappraisal of the relationship of the two classes of medical worker concerned with institutional obstetrics (if the general practitioner beds are under the supervision of the consultant). On the whole the second seems to us to be the less difficult of the two alternatives. But it might modify the relationship between the general practitioner and the consultant and lead to some merging of the two. Such a trend might result in two classes of doctors, one working mainly but not exclusively in hospitals and the other working mainly but not exclusively outside hospitals, each less sharply differentiated by training and conditions of employment than are the consultant and general practitioner of today.

THE SIGNIFICANCE OF AGE-PATTERNS OF FERTILITY IN HIGH FERTILITY POPULATIONS

ANSLEY J. COALE AND C. Y. TYE*

INTRODUCTION

THE study of age at marriage and age-patterns of fertility was given new impetus by the post-war "baby boom" observed in various industrialized countries in the West, where the marriage rate has been shown to be sensitive to temporal variables such as economic prosperity, and to produce "spurious" (i.e., misleading) short-term changes in the birth and reproduction rates by its fluctuations. More recently, attention is being directed, notably by Ryder,[1] to the importance of age at marriage as a factor in the demographic transition in those countries and, moreover, as a variable of possibly considerable significance in the demographic future of preindustrial communities currently characterized by early age at marriage.

Fortuitously, in the course of our examination of differences in crude birth rates between ethnic groups in Singapore, which appeared contradictory to differentials in their gross and net reproduction rates, we were prompted to examine quantitatively the potential implications of alternative or changing age-patterns of fertility among high-fertility populations. We present our results and discussion here in the belief that they will help to clarify quantitatively the demographic significance of postponement of marriage or of childbearing, particularly in high-fertility populations.

* Mr. Tye, at the Office of Population Research, Princeton University, at this writing, has returned to his post as Lecturer in Medical Statistics, University of Malaya in Singapore.

[1] Ryder, Norman B.: The Conceptualization of the Transition in Fertility, *Cold Spring Harbor Symposia on Quantitative Biology*, Vol. XXII, 1957. [Ryder deals more extensively and explicitly with the advantages to underdeveloped areas of later patterns of childbearing in a paper presented at the August, 1960 meetings of the American Sociological Association. The manuscript of this paper, "Nuptiality as a Variable in the Demographic Transition," was not available to us until our analysis had been completed. Having this paper in hand we now note that our work complements his by emphasizing the *quantitative effects* of variations in the age-patterns of fertility.]

Ethnic Group Differential in Singapore

The fertility indices for Malaysians and Chinese in Singapore, 1956–58, are as follows:[2]

	Malaysian	*Chinese*
Gross Reproduction Rate	3.06	3.11
Crude Birth Rate per 1,000	47.91	42.08
Child/Woman Ratio	1.05	0.90

The direction of the difference between ethnic groups in the last two indices is apparently contra-indicated by that for the gross reproduction rates. Another anomalous relation is that the Chinese population has a higher net reproductive rate—2.88 to 2.64—but a lower crude rate of natural increase—35.1 to 38.1 per thousand.

Our first reaction was that these opposite differences probably resulted from fortuitous differences in age and sex distributions. Mortality is somewhat higher among the Malaysians, but this could not account for the pattern. One other observed difference is in the age pattern of the fertility schedules of the two ethnic groups (See Fig. 1). Compared to the Chinese, the Malaysians reach peak fertility at a lower age, followed by a more rapid decline at higher ages. To evaluate the effect of this difference, we calculated *stable* (Lotka) age distributions with the two fertility schedules, combined with the life table for the Chinese female population, and found that the stable (intrinsic) female birth rates were 45.1 for the Malaysian fertility schedule and 42.1 for the Chinese. The intrinsic rates of increase were 39.7 and 36.4 per thousand respectively. Thus, the difference in the crude rates can be explained in part by the fact that younger procreation among the Malaysians produces relatively more births annually and a higher rate of population growth, even when the total number of children born during

[2] Calculated from data in Annual Reports on the Registration of Births and Deaths. Singapore, Government Printing Office; and 1957 Census of Population, Singapore. Preliminary Release No. 5. Singapore, Government Printing Office, 1959. The child/woman ratio given here is the number of children under 5 divided by the number of women aged 15–44 years.

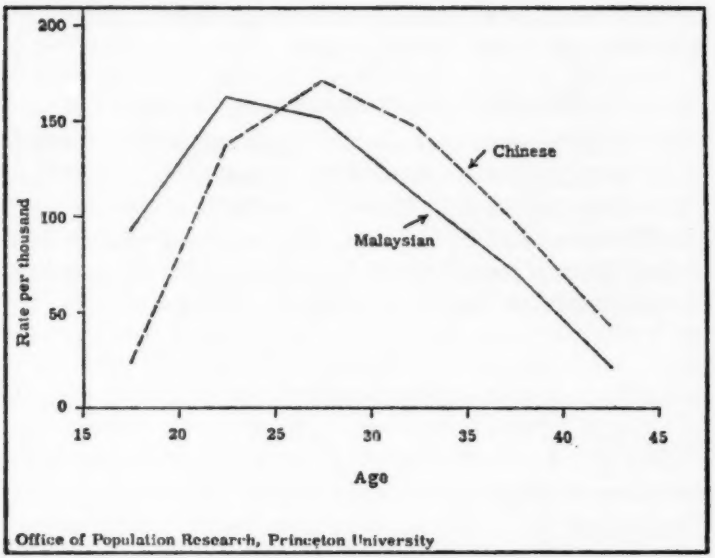

Fig. 1. Fertility schedules for Malaysians and Chinese in Singapore, 1956–1958. (Female births per thousand females.)

the childbearing span of each surviving woman is *less* than for the Chinese.[3]

The mean length of generation for the Malaysian fertility pattern is 26.4 years, and that for the Chinese 29.1. In these two populations, the 'older' pattern of childbearing is associated with a lower rate of growth equivalent to 8.3 per cent lower fertility at every age[4] in the 'younger' pattern. If the partially compensating effect of the higher fertility associated with the older pattern were removed, the difference would be equivalent to 10 per cent at every age. That is to say, if the Malaysians were to adopt the Chinese age-pattern of fertility while retaining the same gross reproduction rate, the long-run effect

[3] We have omitted consideration of errors and fortuitous variability here in order to present the argument by a simple model. The influence of level of mortality will be considered in a later section.

[4] For the method of estimating the change in fertility required to produce a given change in the intrinsic rate of growth, see A. J. Coale: The Effects of Changes in Mortality and Fertility on Age Composition, *Milbank Memorial Fund Quarterly*, January, 1956, 34: pp. 79–114.

would be identical to a reduction of 10 per cent at every age in their own age-specific fertility rates.

Re-examination of Lotka's Example

In an early statement on his stable population concepts, Lotka[5] developed a simple formula for estimating the effect on the intrinsic growth rate of postponing the "reproductive cycle" (fertility schedule) by n years. The resulting change in the intrinsic growth rate, denoted by Δr where r is the rate before the postponement, can be expressed as follows:

$$\Delta r = \frac{\log_e \frac{l_{T+n}}{l_T} - nr}{T+n} \qquad (1)$$

where $\frac{l_{T+n}}{l_T}$ is the probability of surviving from age T (the mean length of generation before the postponement) to age $T+n$.[6]

In Lotka's numerical example, r was 5.47 per thousand, T was 28.33 years (the values for the native white population of the United States in 1920), and n was arbitrarily taken as 5 years. The decrease in r was 1.85 per thousand, and this was equivalent to a decrease in fertility at every age by only 5.2 per cent—not a strikingly large change. This rather small magnitude of change, in spite of a postponement of 5 years, results from his choice of an example in which both mortality and fertility are low, so that both terms in the numerator of the expression in (1) above are small.

However, if fertility is high, the effect of postponement on the intrinsic rate of increase can be quite substantial because the sum of the two terms in the numerator must be large. In particular, with low mortality, r, and consequently the second

[5] Dublin, L. I. and Lotka, A. J.: On the True Rate of Natural Increase, *Journal of the American Statistical Association*, September, 1925, 151: pp. 305–39.

[6] Note that if n is positive, as in the example which Lotka offers where fertility is *postponed*, $\frac{l_{T+n}}{l_T}$ is less than 1; hence the term $\log_e \frac{l_{T+n}}{l_T}$ is *negative*. Note also that if r is negative, the effect of postponing fertility by n years can be zero, when $nr = \log_e \frac{l_{T+n}}{l_T}$.

term in the numerator, is large; whereas when r is small, with high mortality, the *first* term will be large. Thus, with the higher fertility of Singapore, a difference of only 2.7 years in the mean length of generation between the Malaysians and Chinese is equivalent to a greater difference in fertility than a postponement of 5 years in Lotka's example.

A further peculiarity in Lotka's example may be mentioned here. In reality, postponement of fertility, whether through postponement of marriage or otherwise, does not usually result in the fertility age schedule being bodily shifted along the age-axis as assumed in his example, but simply in changing the shape or skewness of the fertility schedule over essentially the same age range. Nevertheless, this in no way reduces the applicability of equation (1), but simply requires that n be replaced by $\triangle T$, the increase in the mean length of generation brought about by the change. A necessary condition, however, is that the gross reproduction rate be identical for both fertility patterns concerned, so that the change in the intrinsic growth rate is generated by the postponement in fertility *without* any change in the total number of children born during the reproductive span of each surviving woman.

Equation (1) may therefore be re-written

$$\Delta r = \frac{\log_e \frac{l_{T+\Delta T}}{l_T} - r\Delta T}{T + \Delta T} \qquad (1a)$$

Why Age Patterns Affect Growth

The foregoing equation may be re-stated as follows to show the greater growth associated with younger fertility, i.e., writing $\triangle T$ as the number of years by which the mean length of generation is *reduced:*

$$\Delta r = \frac{\log_e \frac{l_{T+\Delta T}}{l_T} + r\Delta T}{T - \Delta T} \qquad (1b)$$

$$\cong \frac{{}_{\Delta T}q_{T-\Delta T} + r\Delta T}{T - \Delta T} \qquad (2)$$

where q is the conventional life-table notation for probability of dying.

The two essential reasons why a younger pattern of fertility produces faster growth are: a) younger childbearing permits some births to occur that otherwise would be prevented by mortality, and b) the growth per generation that is supplied by a given average number of offspring is compressed into a shorter period to produce a higher *annual* rate of growth. (The latter reason is a well known defect of the net reproduction rate viewed as a measure of reproductive performance. It is a measure of reproduction per *generation*, and the mean length of generation is not constant.) These two "reasons" correspond precisely to the two terms in the numerator of formula (2) above, the first term ($_{\Delta T}q_{T-\Delta T}$) showing the contribution of reduced mortality, and the second ($r\Delta T$), the contribution of the reduction in mean length of generation.

An alternative approximate interpretation of this formula can be derived by considering the shape of the age distribution. When fertility is high, the stable age distribution shows a rapid decrease in the number of women as age advances through the childbearing span. Thus, younger childbearing means childbearing by a larger proportion of the female population, and we can estimate the effect by comparing the proportions at age T and $T - \Delta T$. Denoting proportion by c, we have (in the original stable age distribution):

$$\frac{c_{T-\Delta T}}{c_T} = e^{r\Delta T}\frac{l_{T-\Delta T}}{l_T} \qquad (3)$$

A k per cent difference in the proportion of women at the mean age of childbearing (approximately equal to T) is very nearly equivalent to a k per cent difference in fertility at all ages. If the proportion bearing children at every age were changed by a factor k,[7] we have

$$\Delta r = \frac{\log_e k}{T}$$

[7] Coale, A. J.: *op. cit.*

If now we let k equal to $\frac{c_{T-\Delta T}}{c_T}$ in (3) above, we get by substitution:

$$\Delta r = \frac{\log_e \frac{l_{T-\Delta T}}{l_T} + r\Delta T}{T} \qquad (4)$$

a formula identical with (1b) except that the denominator is T instead of $T - \Delta T$. If ΔT is small the difference is trivial. For larger values of ΔT, equation (4) fails to allow for the difference in the age distribution itself resulting from the change in the fertility pattern. To a close approximation, then, the two parts in the numerator of equation (1a) or (1b) represent the mortality and growth components of the difference in proportions at age T and $T - \Delta T$ in the stable population.

If fertility is low, differences in the age-pattern of childbearing can be inconsequential or even have an effect opposite to what we have discussed. Although the mortality component always works towards faster growth associated with a shorter mean length of generation, this can be more than offset by the opposite effect of the growth component if the rate of growth is negative. Thus, in the numerator of formula (2), the first term (which is always positive) can be offset by a larger negative second term, if r is sufficiently negative; and the effect of a lower age of childbearing would then be equivalent to lower, rather than higher fertility. This is because a) with a net reproduction rate less than one, a shorter mean length of generation implies a faster annual decline because approximately the same decline occurs in a shorter time, or b) with a negative growth rate the younger age groups tend to have smaller numbers of women, and a lower age of childbearing brings fewer births.

Hutterite and Cocos Islands Fertility

To illustrate further the quantitative significance of fertility age-patterns in high fertility populations, we have taken fertil-

ity schedules from two extraordinarily prolific populations—on the one hand the women of the Cocos Islands (GRR = 4.17), and on the other the Hutterite women of western North America (GRR = 4.00).[8] The Cocos Islanders are characterized by especially early marriage and frequent pre-marital conceptions, while the Hutterite women marry only infrequently before the age of 20 and have almost no pre-marital conceptions. There is a difference of about 3.5 years between their mean lengths of generation.

In order to isolate the effect of the difference between the age patterns, we multiplied the Cocos Islands' age-specific fertility rates by 4.00/4.17 so that both fertility schedules had the same gross reproduction rate of 4.00. The two schedules were then combined with each of three widely different mortality conditions by using life tables with expectation of life at birth of 20, 50 and 70 years respectively. The increase in r and the equivalent increase in fertility resulting from the substitution of the Cocos Islands' fertility patterns for the Hutterite pattern are shown in Table 1.

The effect of the difference between the fertility age-patterns is greater the more favorable the mortality conditions. With an expectation of life of 70 years, we find that the earlier fertility of the Cocos Islanders would produce an intrinsic

Table 1. Stable population indices with Hutterite and Cocos Islands fertility schedules and various life tables.

Life Table $\mathring{e}_o$	T		ΔT	$\Delta T^{q}T - \Delta T$	r × 1,000		Δr	Per Cent Difference* in Effective Fertility
	Hutterite Schedule	Cocos Islands Schedule			Hutterite Schedule	Cocos Islands Schedule		
20	31.14	27.55	3.59	.0901	5.4	9.1	3.7	12.2
50	31.42	27.89	3.53	.0225	33.5	38.6	5.1	17.4
70	31.48	27.77	3.71	.0042	42.4	48.1	5.7	19.6

* Per cent increase in Hutterite fertility required to produce the r associated with the Cocos Islands fertility schedule. (See footnote (4) on page 633).

[8] Smith, T. E.: The Cocos-Keeling Islands: A Demographic Laboratory. *Population Studies*. November, 1960, 2: pp. 94–130. Eaton, J. W. and Mayer, A. J.: The Social Biology of Very High Fertility Among The Hutterites. *Human Biology*. September, 1953, 3: pp. 206–264.

growth rate of 48.1 per thousand, compared to 42.4 for the later fertility of the Hutterites. It would require some 20 per cent higher fertility in the Hutterite age-pattern to produce this increase of nearly 6 per thousand in the growth rate.

The outcome of these calculations can be stated in the following terms: the Hutterite population would need a gross reproduction rate of 4.49 if $\mathring{e}_0$ were 20 years, a rate of 4.70 if $\mathring{e}_0$ were 50 years, and a rate of 4.78 if $\mathring{e}_0$ were 70 years, to reproduce as rapidly as the Cocos Islanders with a rate of 4.00.

Additional Transitory Effect of Change in Age-pattern

The long-run effect of a change in the age-pattern of fertility on population growth has been evaluated above by comparing stable (intrinsic) rates produced by simulated 'initial' and 'terminal' fertility age-patterns, holding total fertility constant. In addition to this long-run effect, there is an important transitory effect produced by the 'piling up' or 'thinning out' of births that occurs when the age-pattern of fertility changes.[9] To isolate this effect, consider a hypothetical increase in average age of childbearing in successive cohorts of women such that all cohorts have a net reproduction rate of unity. Assume that mortality at ages near the mean age of childbearing is negligible. Since the population is not growing, the increase in length of generation would neither accelerate nor decelerate growth, and the long-run consequences would be nil. Yet when the *change* from the younger to the older pattern of childbearing is taking place, there would be a substantial decline in the birth rate. This birth rate would recover after a period of transition, but there would be no tendency to 'make up' for the 'lost' births unless the mean age of childbearing were to be restored to the original lower value.

The number of births lost can best be visualized by imagining

[9] The 'spurious' fluctuations in total fertility and birth rates resulting from short-term changes in cohort mean age of childbearing have been analyzed in great detail by Whelpton, Ryder and others, in relation to inter-war and post-war experiences in some Western countries. We feel, however, that there is a need for a comparatively simple explanation here, to facilitate interpretation of our population projection which follows.

that all births occur *at* the average age of childbearing of each cohort. Suppose that the cohort reaching age 25 this year produces all of its births (just enough for replacement) during this year, while the next cohort (now aged 24) waits until age 30 to produce its births. During the next five years there would be *no births at all,* and the total immediate loss (not counting second generation effects which contribute further losses, i.e. births not occuring to the children not born) will be the births that would normally have occurred in five years —the period corresponding to the increase in average age of childbearing.

With births dispersed through a wider range of childbearing ages rather than concentrated at one age, an increase of 5 years in the mean age of childbearing produces the same total loss, but spread over a longer period of time.

This transitional 'loss' in births is in addition to any long-run decline caused by a shift to later childbearing, and the combined effect is illustrated in a population projection which follows.

A Hypothetical Fertility Age-shift Applied to India

The following projection shows how the growth in the female population of India, as estimated by Coale and Hoover,[10] would be affected if the Indian fertility pattern were to shift to the older pattern of the Singapore Chinese during the 10 year period beginning in 1956. We have assumed that the female cohort aged 15–19 in 1956 experiences the age-specific fertility rates used in the Coale-Hoover projection, following which each subsequent cohort progresses 10 per cent annually towards the age-specific rates in the other schedule. Thus the cohort aged 15–19 in 1966—and all subsequent cohorts—will experience the new fertility pattern. Table 2 shows the assumed evolution of age-specific rates. All cohorts have the same gross reproduction rate of 2.64, but the *period* GRR shows a transi-

[10] Coale, A. J. and Hoover, E. M.: Population Growth and Economic Development in Low-Income Countries. Princeton University Press, 1958, p. 352.

Age	Age-specific Female Fertility Rates (per 1,000 Women) in							
	1956	1961	1966	1971	1976	1981	1986	1991
15–19	92	56	19	19	19	19	19	19
20–24	130	130	124	118	118	118	118	118
25–29	121	121	121	133	145	145	145	145
30–34	91	91	91	91	108	124	124	124
35–39	67	67	67	67	67	75	83	83
40–44	26	26	26	26	26	26	32	37
GRR	2.64	2.45	2.24	2.27	2.42	2.54	2.61	2.64

Table 2. Age-specific female fertility rates resulting from a shift from the fertility pattern estimated for India, 1956, to that of the Chinese in Singapore in 1956–58 adjusted to the same Gross Reproduction Rate. (All cohorts through that aged 15–19 in 1956 have the Indian pattern; all cohorts from that aged 15–19 in 1966 have the Singapore pattern; and intervening cohorts exhibit a linear change.)

tory fall, reaching a minimum of 2.24 in 1966, a decline of 15 per cent.

In Figs. 2 and 3, the birth rates and total population (females) resulting from this projection are compared with the Coale-Hoover projection assuming no change in fertility, and with another projection assuming a 20 per cent linear decline between 1956 and 1966.[11]

Note that the fertility age-shift produces a transitional effect in the first ten years similar to a fertility decline of 20 per cent occurring linearly in the same period. Even for 20 years, the cumulative saving in births is not much less than that achieved by a 20 per cent decrease in fertility, as shown in Fig. 4. This effect is more pronounced than the change of 15 per cent in the period GRR would suggest, and is explained by the fact that the fall in the GRR (see Table 2) is due not to a fertility decline distributed over the whole range of reproductive age but to a disproportionate decline in the younger age groups (the cohorts in the ages 15 to 24) where the effect on total period fertility is greatest.

It would be appropriate here to emphasize that the birth and growth rates do *not* eventually return to the levels where they

[11] The mortality assumptions are identical for all three projections.

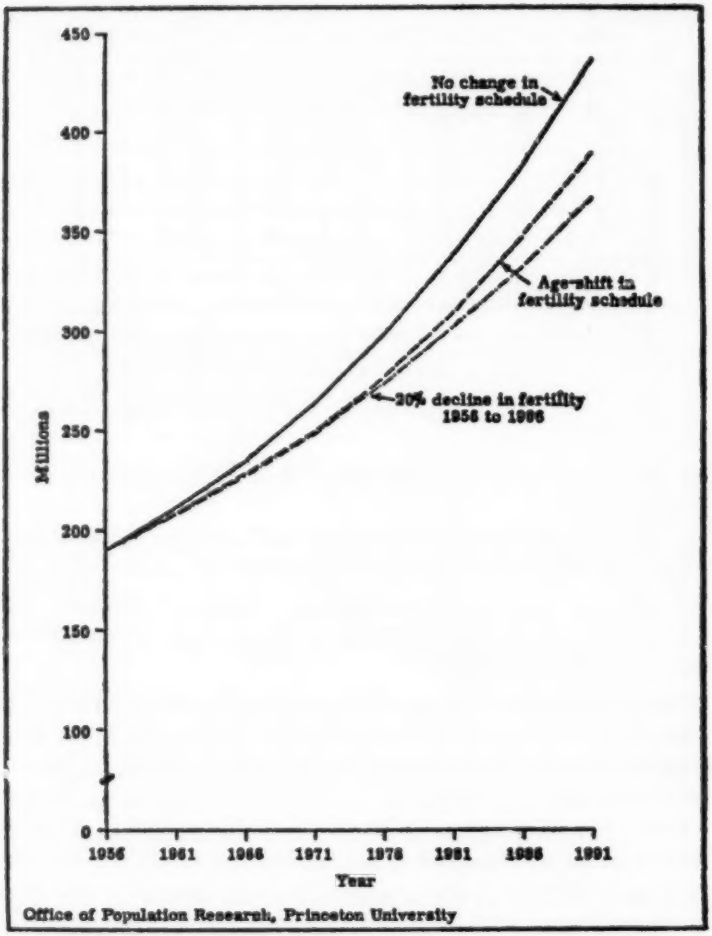

Fig. 2. Projected female population (millions) of India, 1956–1991, with various fertility assumptions.

would have been without the fertility postponement, even though the period GRR regains its initial level when the change to the new fertility age-pattern is completed. The long-run effect can be shown by applying stable population analysis, as before, to the 'initial' and 'terminal' fertility age-

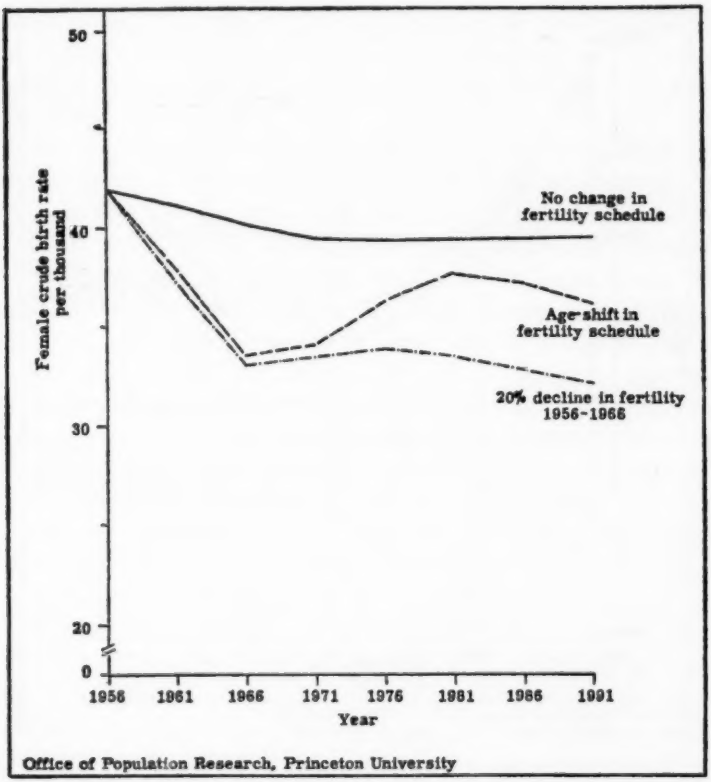

Fig. 3. Projected female crude birth rates with various fertility assumptions, India, 1956–1991.

patterns involved, and the results are shown in Table 3. Note that the increase of 2.7 years in the mean length of generation is associated with a reduction of 3.1 per thousands in the intrinsic rate of growth, which is equivalent to about 8 per cent lower fertility without the change in age-pattern.

Implications for Countries with High Fertility and Early Marriage

We have shown that the difference in effective fertility (population growth) between populations with early childbearing

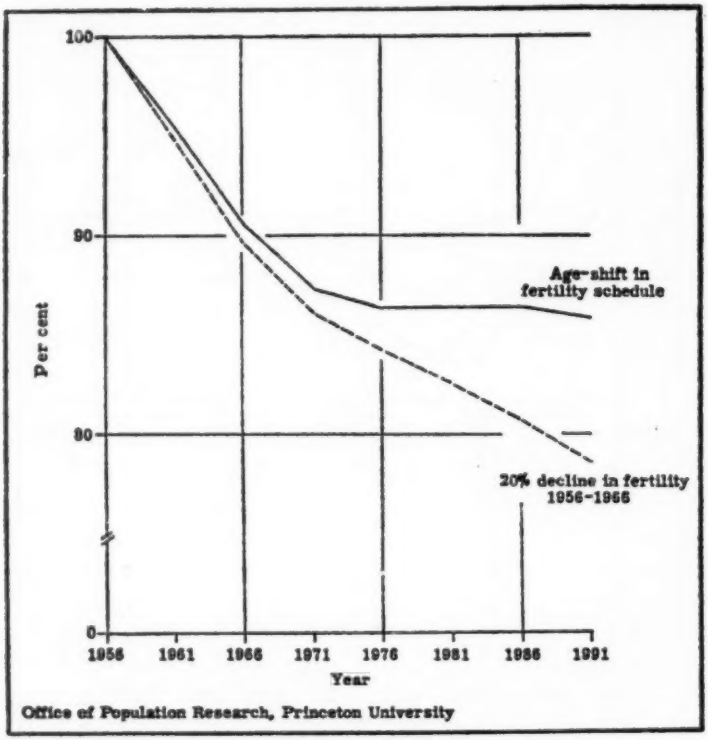

Fig. 4. Cummulative projected births from 1956, India, 1956–1991. No change in fertility = 100.

and late childbearing is of surprisingly large magnitude when fertility rates are high. In countries where contraceptive practices are virtually absent or comparatively ineffective, differ-

Table 3. Stable population indices with the fertility schedules before and after the age-shift assumed in the projection (using the life table estimated for India in 1981–5).

Fertility Pattern	T	r(× 1,000)	Per Cent of Change in Fertility to Produce Other "r"
Indian (1956)	26.34	27.21	−7.9
Singapore Chinese (1956–8)	29.03	24.10	9.5

ences in age at childbearing result principally from differences in age at marriage, and the effects of postponement of childbearing can be interpreted, therefore, as the effects of postponement of marriage.

The relation between age at marriage and completed size of family has been studied by many demographers, but no consistent relationship has been demonstrated. Some studies indicate that later marriage is associated with smaller numbers of children ever born, in non-contraceptive populations, but one cannot tell whether early marriage *causes* a more fertile union, or whether 'intrinsically' more fertile couples tend to marry earlier. On the other hand, it is possible that the fecundity of some very young brides is impaired by premature cohabitation and pregnancy, so that the postponement of very early marriages could *increase* completed size of family. Uncertainty on this score has, we believe, inhibited serious or adequate consideration of the long-term effects of postponing marriage, and certainly diverted attention from the evaluation of such effects independently of completed family size.

Our objective, in the preceding calculations, has been to show that postponement of marriage can contribute substantially to reduction in birth rates and population growth[12] even when completed size of family is *not* reduced, and that this contribution is potentially greatest in those countries which have the highest fertility and low average age of marriage. In so far as the average size of family is also more likely to fall than to remain unaffected by later marriage, this contribution is likely to be even greater than our models would suggest.

We do not, however, profess to know exactly how postponement of marriage can best be accomplished—this clearly depends on the circumstances in each country—nor to know how much postponement in marriage is required to produce a given increase in the value of T, the mean length of generation. Nevertheless, our calculations suggest that postponement must

[12] Although the analysis has been confined to females, the interpretation can clearly be extended to both sexes since the sex ratio of births is relatively constant.

be given serious consideration as a powerful supplementary component of population policy in the crucial decades ahead. Postponement would provide a substantial and immediate transitory reduction in the birth rates as well as a smaller permanent decline, and these would be in addition to, and perhaps even help to promote, further decline ultimately achieved through more prevalent and effective practice of contraception.[13]

Other Implications of the Age-pattern of Childbearing

Many demographers have viewed with skepticism reports of birth rates of 60 or more estimated from sample records for some parts of Africa. With young childbearing, these rates are not as improbable as was once thought. The Cocos Islanders, for example, would have a stable birth rate of 61 per thousand if their expectation of life at birth were 20 years and their fertility 4 per cent less than it is. With the older childbearing of the Hutterites, on the other hand, the birth rate would not exceed 56 with comparable high fertility, no matter what the mortality level is.

The magnitude of the influence of age on effective fertility also emphasizes the limitations of some conventional fertility indices for comparative purposes. For example, total fertility rates, gross and net reproduction rates, and data on completed size of family are measures of fertility only when fertility is viewed as the average life-time performance of cohorts (real or synthetic) of women. A higher gross reproduction rate means more children born during a life-time, but this cannot be considered as an indication of *reproductive* performance in a population (not even gross of mortality) unless the mean age of childbearing is taken into account. The reason for this is clear from the examples given earlier.

[13] Ryder, N. B.: *op cit.* Ryder has argued persuasively that postponement of marriage would have a powerful tendency to offset the social forces that sustain marital fertility at a high level, in addition to the timing effects that we have emphasized.

ANNOTATIONS

PLANNING FOR MAURITIUS[1]

THE problems of Mauritius are depressingly familiar: a small island with a single crop economy (99 per cent of the exports are sugar), a low average income and an expanding population. The problems are even more severe than in most places, for Mauritius is extremely isolated: it is 500 miles east of Madagascar in the Indian Ocean; the population density on this island of 720 square miles is over 900 persons per square mile, making it one of the most densely inhabited areas in the world; the recent increase in population, combined with the stagnant situation of the sugar market, have produced a declining economy, and this decline has been aggravated by cyclones in 1945 and 1960; and both real national income per head and output of sugar per head has been declining in the fifties. Mauritius is an underdeveloped economy with all its problems and has not even made a start toward development.

The British colonial administration has employed expert help to design a governmental program dealing with the whole complex of problems and their interconnections. Two commissions were assigned reports, in which the approach is divided according to two governmental functions: Meade's group deals with economic programs and Titmuss' group with social insurance. As both reports see it, both aspects are dominated by the population problem, which is the main burden of Titmuss' report. Meade recognizes that most economic remedies which

[1] Meade, J. E. *et. al.*: THE ECONOMIC AND SOCIAL STRUCTURE OF MAURITIUS. London, Methuen and Co., Ltd., 1961. 246 pp.

and

Titmuss R. M. and Abel-Smith B.: SOCIAL POLICIES AND POPULATION GROWTH IN MAURITIUS. London, Methuen and Co., Ltd., 1961. 308 pp.

he proposes could be vitiated by unchecked population increase, but he refers to Titmuss' exhaustive discussion. Let us look at the purely economic problems first.

The first few chapters of the Meade report are a model of clarity of exposition of the economic situation and the underlying factors not only of Mauritius, but of many countries in similar straits. The report looks at several possible remedies. The market for sugar is unlikely to increase; thus, increase in production should be discouraged. A tax on total production is suggested as this would equalize the burden and eliminate the inefficient producer in contrast to a quota system. Other agriculture should be expanded, if possible, but without encouraging uneconomical production through subsidies. The two most likely export products—tea and tobacco—should be developed, and government aid should be given for the production of high quality products at competitive costs with other major producers.

The limitations on expansion of agriculture are so severe that any substantial increase in the economy would have to come from industrialization. While Mauritius has little capital for investment, and little chance of attracting outside capital, it does have an abundant labor supply. Thus, Mauritius should try to build industries which use much labor in relation to its capital investment. Examples would be jewelry, leather goods, artificial fibers and tourism. It would be imperative, however, for the manufacturers to forego even some mechanization which they could afford.

Industries should not become refuges for cheap labor; on the other hand, substantial wage increases would nullify the advantage of a labor supply for Mauritian industry. The authors suggest improvement in real income for labor, without the increase in wage rates which would be reflected in the price of goods. They urge the union to negotiate for fringe benefits, social security, medical care and the subsidization of the cost of living. Two other aspects of the labor situation deserve mention. Although there is widespread unemployment, the sugar industry shows a considerable labor shortage. This is due in part to the attitudes of prospective workers who reject manual, agricultural work and prefer to wait for low-paying

white-collar government positions. Also, this is partly due to a system of contract labor hiring which accentuates the seasonality of the work and discourages young workers from going into it. The latter could be abolished and sugar employment regularized. In addition to this, a campaign would have to be instituted to reduce the prejudice of young workers against manual labor, coupled with a reduction of excess government clerical jobs.

Finally, labor supply depends on an adequate educational system. The main difficulty here is the multi-lingual background of the population—French Creole, English, Hindi, Urdu, and Chinese. Adaptation of the school system to the different backgrounds has resulted in the familiar illiteracy in several languages. The authors suggest required education in English only, fully realizing the difficulty of such an approach in the face of national self-consciousness.

It can be seen that this program is reasonable and well thought-out. Too, it depends on a large degree of self-restraint. This restraint shows itself in the requirement for sugar planters to decrease cultivation, for other agriculturalists to take guidance in production instead of subsidies, for manufacturers to create industries to use a large amount of labor, for unions to desist from increase in wage rates, for workers to accept work in the cane-fields, and for ethnic groups to accept English as the standard language. Although attention is given in each individual case to the difficulties involved, the sum of them becomes staggering and would require attention to the problem of motivation as such, to the conditions under which the population is willing to cooperate in a program which requires immediate sacrifices for long-range gains. This problem of motivation and influence is nowhere clearer than in the reduction of population growth.

Titmuss considers the question of social welfare and population control as an interconnected problem. His projection of the future population shows that, under present conditions, the population would more than double in 25 years, from 600,000 in 1957 to over 1,300,00 in 1982. Even if age-specific fertility were reduced to its 1952 level and mortality stayed constant (i.e. if there were no improvements in medicine and

public health) the population would rise to nearly 1,150,000. Only if the number of births per woman could be reduced to three would the population stay below 1,000,000 in 1982—approximately 980,000.

Besides reduction of fertility, emigration could be suggested as a means of decreasing population. This is an unlikely remedy. Distance from prospective immigration countries makes migration expensive, and hence would require considerable capital for each family migrating. In addition, training for emigration would use the educational facilities needed for producing a local skilled labor force, and would draw off just those people who are needed for the economic development of the country. As the experiences of other countries have shown, even substantial planned emigration makes hardly a dent in the population size; therefore, a definite policy in this direction would have little effect on the basic problem and would make industrialization for the remaining population more difficult. Thus, the Titmuss report is concerned with a social policy which would be equitable and at the same time achieve the three-children family.

The central part of the proposals are on family benefits, encouraging late marriage, low fertility and spacing of children. This includes the following: a marriage benefit for the first marriage of a childless woman over 21; maternity benefits for the first three children (with the youngest child two or over) of women over 21 who had some birth control instruction; standard family benefits for all families with three children or more (independent of the number of children); and abolition of allowances for children in payment of income tax. Other social services are to be modernized and brought into agreement with this policy; for instance, as a part of improved medical services, a family planning service should be established by the government. He also suggests a privately financed large-scale demonstration study on family planning education on the model of those done elsewhere.

This program would pre-suppose a definite government policy in support of a three-children family, and Titmuss explains convincingly and in great detail the need for such a policy. With the expected increase in population, costs of

social services will become prohibitive, especially if they are based on number of children. Richard Meier, in his book MODERN SCIENCE AND THE HUMAN FERTILITY PROBLEM, has used Mauritius as a cautionary example of a society with unchecked population growth, and Titmuss uses his description to great advantage. Nevertheless, he realizes the likelihood of opposition; he hopes, however, that it can be overcome. In this respect, the tenor of both reports is the same in that they hope that reason will prevail in problems of an intricate social, cultural, political and motivational context. A part of the summary states this view, which can be applied to all the proposals:

> Under certain conditions—and admittedly very stern conditions—the challenge of over-population could, in one generation, be largely overcome. Already certain countries, for example Japan and Puerto Rico—are showing the way. With its relatively small size, ease of communication, educational provisions and other advantages, Mauritius could soon begin to rival them. It could set an example to the poorer countries of the world. It could make its own contribution towards solving the great problem of poverty.
>
> We do not think that a purely negative approach to this question of family limitation would by itself have much appeal. It has to be seen and understood in the whole context of social and economic advance. (p. 241)

Unfortunately, these hopes have so far not been borne out. On account of public reactions, the 1960 legislature postponed *sine die* a discussion on a program for family limitation.

KURT W. BACK

• • •

STATISTICAL GEOGRAPHY[1]

THIS generally excellent presentation is advertised as "a handbook without parallel for social scientists concerned with areal analysis." This is a reasonable claim because it is

[1] Duncan O. D.; Cuzzort, R. P.; Duncan, B.: STATISTICAL GEOGRAPHY: PROBLEMS IN ANALYZING AREAL DATA. Glencoe, Illinois: The Free Press, 1961. 191 pp.

literally the first such exposition to attempt a survey of the entire store of tools at hand. Even so, the presentation is incomplete. During the time it apparently was in press, significant contributions were made and gains consolidated.

Professional practice in geography and related disciplines has resulted in an unduly long barren period between the two world wars—a time during which virtually no attention was paid to the particular theoretical and methodological problems now deemed so important in this work. It would seem that this certainly is not unrelated to the fact that geography has lost its prominent position in the curricula of certain leading academic institutions.

The current awakening in the subject and the merged interests of sociologists, geographers, regional scientists and others have brought such a large and continuing flow of important contributions that whosoever would at any time now attempt to assay the field can hope only to provide a summary to that date, to point out trends, and to identify "problems which seemingly need to be solved" before a definitive textbook or manual for the analysis of areal data can be offered. This is precisely the attitude the authors have assumed, with excellent results.

A quite original contribution can afford to be "locked up" for a fairly long time in press. Not so, however, for any work which is substantially a summary or review inventory as is *Statistical Geography*. An examination of the bibliography of this work is revealing. Of the 148 items cited, only 16 predate World War II, with a large number of these only tangentially related to the subject matter here. The quickening pace of pertinent publications since World War II is faithfully reflected by the bibliography at least until 1957. For that year there is the maximum number of 26 works cited. However, despite the fact that recently the pace has been even further accelerated, Duncan, Cuzzort and Duncan list only 11 items for 1958, six for 1959, and one for 1960. The 1960 item is a product of one of the authors, and hence accessible to him before its publication date. In reality, 1957 should not be considered a peak

year. Certainly each year since has produced even more significant works although, of course, this is largely a matter of individual opinion at this early date.

Despite the fact, then, that this work seems even now seriously limited and outdated, there is much of considerable value to be studied carefully and appreciated. For example, an intriguing presentation and explanation of the effects of the differences in the sizes of areal units upon measurement, certain kinds of correlation, and inferences is offered. Here the problems arising from the fact that many computed measures are not parametric to the actual areal distributions but rather to the arbitrary system of areal subdivision employed are investigated. Unfortunately, the authors were not able to (or did not) present pertinent very recent (and earlier) findings based on spatially continuous variables which help to overcome many of the difficulties they see as due somehow to the inherent nature of the data to be considered. In particular, they have neglected the means of measuring the degree of areal association of two discrete populations when macroscopic spatially continuous point "accessibility" values are used rather than more microscopic, arbitrary areal "density" values which in the limit are meaningless. It is therefore regrettable that the authors further endorse the frequently quoted but misleading statement that every change in scale (taken here to mean change in the size and hence number of areal subdivisions considered as basic units of association with no change in the total universe area) "will bring about the statement of a new problem, and there is no basis for presuming that associations existing at one scale will also exist at another." In light of recent developments, to continue research in these terms of "areal levels of generalization" is no longer nearly so relevant and, in fact, can be quite misleading.

An intriguing presentation of the nature of, and the means of capitalizing on the ofttimes apparent inconsistencies resulting from the temporal and areal analyses of comparable data is offered. To this reviewer, the discussion of the temporal

aspects of areal variation comprises the high point of the book despite a minor irritation resulting from the fact that the authors lend additional currency to the use of the term "longitudinal" in the manner of social scientists which, to the geographer, seems most charitably described as peculiar.

Of approximately equally high calibre is the recurring consideration throughout of the problems associated with the attempts to make inferences concerning individuals in areas when all that are available as variables are averages or proportions for populations in areas. However, no definitive statements of the means of establishing limits are included by the authors.

Routine, but very careful, consideration of the types and the quality of areal data encompass a discussion in which areal units are considered as collections, segments of space, locations, members of a set, and in relation to other units in a spatial context. In this last connection, a potential-of-population map (one of only three maps in the entire book!) for the United States in 1950 is presented. Although this map is generally accurate, impossible bends in contours are displayed apparently because the authors interpolated "rigorously" but not logically among the control point values obtained by summation. While such a summation or mechanical integration is, in practice, necessary to obtain approximate values of potential at various places over an area, it should never be lost sight of that what is being approximated is a definite integral and hence a spatially continuous quantity with an associated continuous gradient as a first derivative. In addition, nonurban values of potential can and should be shown to rise far higher in New Jersey, for instance, than indicated on this particular map despite the excuse that it fails to show details accurately in the vicinity of large urban centers.

While the distinctions in the analysis of areal data as measurement of areal distributions, analysis of spatial structure, and the explanation of areal variation may have a certain validity based on the traditions of academic disciplines, the

continuation of these divisions seems no longer defensible with regard to the now frequent and fortunate crossing of disciplinary boundaries by researchers, and especially in light of geography's recent emergence from its restrictive shell. However, the authors, themselves, it would seem, recognize the virtual inseparability of these considerations. Their apologies for having "trespassed" by presenting this book, while graciously intended, really seem unnecessary.

Especially enlightening is the discussion of so-called "regional differences" as nothing more than "unexplained" or residual variation in contrast to common parlance (and professional shortcuts) where we often speak of "regions" as constituting an influence on social and economic phenomena. Rather than recognizing regions as a cause of areal variation we must look on them as the consequence, or perhaps better as the generalized areal presentation of the results of the interplay of phenomena.

Throughout the entire work, correlation and regression coefficients based on least squares methods are employed. It is assumed that the reader is thoroughly familiar with the elements of conventional statistics, but some consideration is given to the establishment of appropriate tests of significance for areal data suggestive of the problems in auto-correlation for time series.

If another edition of this book is to be forthcoming, or if someone else undertakes to present "a handbook without parallel for social scientists concerned with areal analysis," it is hoped that there will be included a number of additional things not presented here. Especially desirable would be a discussion of the entire range of ideas associated with the computation of the various spatial moments for an areally distributed population. From such computations of moments arise measures of various centers; measures of dispersion, both particular and general; and indices of skewness and kurtosis for areally distributed populations. For actual population distributions over very large areas on the earth's surface, the sphericity of the

earth may also need to be considered. Just as the normal "curve" is a standard in conventional statistics, so too can "surfaces" be employed for areal distributions including both density and probability types. A discussion of the nature and significance of basic and derived quantities, degrees of freedom, and the level of abstraction seems necessary, including the statement of the roles of discrete and continuous variables with emphasis upon the distinction between *smooth* and *smoothed* distributions. One would like also a more adequate indication of some of the more important substantive results already achieved in statistical geography.

Despite the many reservations he has expressed, this reviewer finds this book extremely valuable and unhesitatingly suggests that, for the time being, it be made required reading not only for those whose professional pursuits are especially closely linked to areal distributions, but also for all social scientists.

WILLIAM WARNTZ

• • •

NEGROES AND PUERTO RICANS IN THE NEW YORK METROPOLITAN REGION

OSCAR Handlin's small book[1] is the third of a series of volumes from the New York Metropolitan Region Study. An historian, the author has provided a broad historical setting of successive immigrant stocks in New York City. A century ago the Irish were the newcomers. Later, the various nationality groups from Eastern and Southern Europe were the slum dwellers. After World War I the Negroes from the South began flocking to New York, and since World War II the Puerto Ricans have appeared in increasing numbers. The author indicates that each group in turn was viewed with alarm. Although this backdrop probably provides little comfort to the city fathers worried about problems of juvenile de-

[1] Handlin, O.: THE NEWCOMERS: NEGROES AND PUERTO RICANS IN A CHANGING METROPOLIS. Cambridge, Harvard University Press, 1959. 171 pp.

linquency and gang warfare among the nonwhites in New York City, it does put the problem in historical and sociological perspective.

Having spent a lot of time tramping around Harlem in 1928–1930 interviewing Negro migrants from a particular area of the South[2] the reviewer balked a little at Handlin's designation of the Negroes in the area as "newcomers". However, plenty of the Negroes there are "newcomers" and the term is certainly appropriate for the Puerto Ricans.[3]

In a chapter on patterns of adjustment the author points out that Negro and Puerto-Rican migrants to New York face problems similar to those encountered by the immigrants from Europe prior to the enactment of quota legislation. In those days the immigrants faced problems of poverty and economic hardships. The relatively small numbers of refugee immigrants during the thirties and forties tended to be professional people and people of high economic status in much larger proportions than did the earlier immigrants. The poorer people did not have the means to escape. The Negroes and the Puerto Ricans, our own nationals, tend to be of very low economic status. The Negroes do not have a language barrier but they do have the problem of color. Some of the Puerto Ricans have both handicaps. Color is an especially serious handicap to economic and social advancement despite the progress that has been made.

> Some sectors of both the Negro and Puerto Rican population accept the situation and grow bitter or apathetic in consequence —with deleterious social effects. But a substantial and growing percentage, particularly in the second generation, are determined to find wider and better ways out. (p. 72)

The author cannot be accused of trying either to minimize or to exaggerate the social problems accompanying the migra-

[2] Kiser, C. V., SEA ISLAND TO CITY: A STUDY OF ST.-HELENA ISLANDERS IN HARLEM AND OTHER URBAN CENTERS. New York, Columbia University Press, 1932. 272 pp.

[3] It is also interesting to point out that in 1960 a book was published in England bearing the same title but relating to West Indians in London. *See* Glass, R.: NEWCOMERS: THE WEST INDIANS IN LONDON. London, Centre for Urban Studies and George Allen & Unwin, Ltd., 1960, 278 pp. For a United States edition, *see* Glass, R.: LONDON'S NEWCOMERS: The West Indian Migrants. Cambridge, Harvard University Press, 1961.

Glass's book was reviewed by Dr. James W. Mackintosh in the Milbank Memorial Fund *Quarterly*, January, 1961, 1: pp. 171–174.

tion of Negroes and Puerto Ricans to the New York metropolitan area. As a social scientist, he tries to report the facts and to interpret the relationships and trends that he observes. He accepts the evidence that Negroes and Puerto Ricans contribute disproportionately to juvenile delinquency in New York City. As for reasons, he states:

> . . . whether the specific cause of breakdown be attributed to disrupted families, intergenerational conflict, personal anxieties and frustrations, or the influence of the peer group and the mass media, these explanations reveal the delinquent as an individual unsure of his own intentions and defiant of the authority that sustains values unacceptable or inadequate to his own life. (p. 100)

As for adult crime, "The rate of arrests of Puerto Ricans seems somewhat higher than that of other whites; and that of Negroes is higher still. But the difference is not excessive and is explicable in terms of factors analogous to those involved in juvenile delinquency." (p. 101) The author points out that:

> . . . violations of the law are not regarded within the group with the moral disapprobation attached to them in the wider community. Neither the Negroes nor the Puerto Ricans see any ethical deficiencies in gambling; and they accept policy and its associated rackets as a matter of course. . . . But the long history of gambling in the city and its prevalence among other groups shows that what is different is the form and the open acceptance rather than the extent of participation. (pp. 101–102).

The author states that "only in the addiction to narcotics and in sexual disorders do these groups seem to supply an unusual number of offenders although here too that judgment must be qualified by the possibility that an acquiescent attitude that openly recognizes deviants may account for some part of the apparent excess." (p. 102)

On one matter the author is vulnerable to the charge of ambivalence. In one place he states that the

> . . . common impression . . . that [Negroes and Puerto Ricans] form an undue percentage of the cases on the relief

> rolls has given rise to the belief that these people readily become dependent, although careful studies have shown that the number who seek public assistance is not larger than might be expected in view of their economic and social status. (p. 101)

In another place, among the "concrete conclusions" listed as being sustained by available evidence there is the statement, "the Negroes and Puerto Ricans are likely to continue, as they have in the past, to depend more on governmental services for education and welfare than did earlier immigrants." (p. 119) However, there is no necessary contradiction here. The first statement contains the qualification regarding comparability of economic status. Also, the latter statement relates not to public relief but to general government services. In view of the increasing role of the government in education and welfare since the days of the early immigrants the author might have ended the latter statement with the phrase "and so will all other citizens."

The author ends his text with a statesmanlike appraisal:

> Although the difficulties are genuine and grave, there is every reason to be optimistic about the future, if the society of which these people have become a part allows them to act freely and as equals within it. If New York continues to witness, in the next twenty-five years as it has in the past decade, an abatement of prejudice in accord with its tradition of diversity, the problems of occupational mobility, of education and of the competition for space will certainly be eased. Much depends on making this possibility a reality. The alternative in a democratic society is almost unthinkable. (p. 117)

CLYDE V. KISER

INDEX

TO TITLES OF ARTICLES AND AUTHORS IN THE MILBANK MEMORIAL FUND QUARTERLY

VOLUME XXXIX · 1961

BOOKS

In Collaboration with the Milbank Memorial Fund

Approaches to the Prevention of Disability from Chronic Psychoses, the open hospital within the community. 1957 Annual Conference of the Milbank Memorial Fund, 1958. 80 pages. $1.00.

Causes of Mental Disorders: A Review of Epidemiological Knowledge, 1959. Proceedings of a Round Table held at Arden House [illegible] N.Y. Milbank Memorial Fund, 1961. 384 pp. [illegible]

Current Research in Human Fertility. 1954 Annual Conference of the Milbank Memorial Fund, 1955. 163 pages. $1.00.

Elements of a Community Mental Health Program. [illegible] Annual Conference of the Milbank Memorial Fund, 1956. 2[illegible] pages. [illegible]

Family Health Maintenance Demonstration, the, a contribution to [illegible] investigation of family health. Proceedings of a Round Table at the [illegible] Annual Conference of the Milbank Memorial Fund, 1[illegible] pages. $[illegible]

Interrelations between the Social Environment and Psychiatric Disorders. 1952 Annual Conference of the Milbank Memorial Fund, [illegible] 2[illegible] pages. $1.50.

Interrelations of Demographic, Economic and Social [illegible] Underdeveloped Areas, the. Proceedings of a Round Table [illegible] Annual Conference of the Milbank Memorial Fund, 19[illegible] pages. [illegible]

Nature and Transmission of the Genetic and Cultural Characteristics of Human Populations, the. 1956 Annual Conference of the Milbank Memorial Fund, 1957. 144 pages. $1.00.

Planning Evaluations of Mental Health Programs. 1957 Annual Conference of the Milbank Memorial Fund, 1958. 1[illegible] pages. $1.00.

Population Trends in Eastern Europe, the USSR and Mainland China. 1959 Annual Conference of the Milbank Memorial Fund, 1960. [illegible] pages. $[illegible]

Programs for Community Mental Health. 1956 Annual Conference of the Milbank Memorial Fund, 1957. 2[illegible] pages. $2.00.

Progress and Problems of Community Mental Health [illegible] Annual Conference of the Milbank Memorial Fund, 1959. 25[illegible]

Promotion of Maternal and Newborn Health, the. 19[illegible] Annual Conference of the Milbank Memorial Fund, 1955. [illegible] pages. $1.50.

Research in Public Health. 1951 Annual Conference of the [illegible] Memorial Fund, 1952. 284 pages. $1.00.

Selected Studies of Migration Since World War II. 19[illegible] Annual Conference of the Milbank Memorial Fund, 1958. 2[illegible] pages. $[illegible].00.

Social and Psychological Factors Affecting Fertility. Vol[illegible] III, IV, and V. Milbank Memorial Fund, 1950, 1952, 1955, and 1958. [illegible]

Steps in the Development of Integrated Psychiatric Services. [illegible] Conference of the Milbank Memorial Fund, 1960. 1[illegible] pages. [illegible]

Thirty Years of Research in Human Fertility: [illegible] 1958 Annual Conference of the Milbank Memorial Fund, 19[illegible] $1.[illegible]

Trends and Differentials in Mortality. [illegible] Annual Conference of the Milbank Memorial Fund, 1956. [illegible] pages. $1.00.

[illegible] Press, Inc.
L[illegible], Pa.